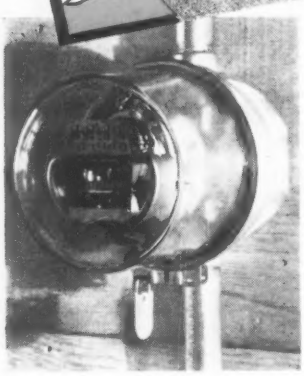
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

DECEMBER 18, 1948

NOW Murray GIVES you REVERSIBLE JAW

IN SOCKET METE
CASES — for
VERTICAL
or
HORIZONTAL
MOUNTING

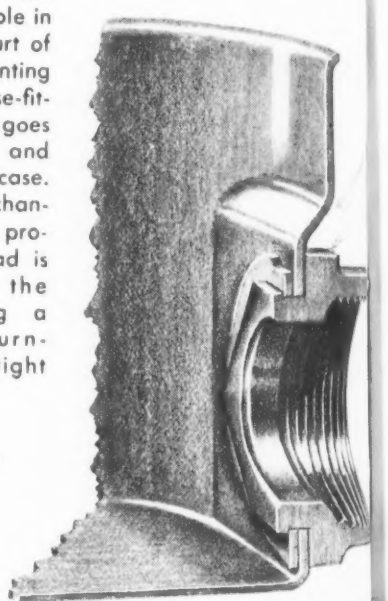


THIS newest Murray feature—and the pictures show how simple it is—vastly increases the use of these socket meter cases, drawn of 3 So aluminum. The speed with which the reversal can be made, commends it to all electricians; and the fact that the same case does equally well for vertically or horizontally mounted meters, reduces the stock which dealers must carry.

HOW the heavy H
is permanently
SEALED in!

THE hex end of the hub fits a hex hole in the flattened part of the case, preventing turning. A close-fitting hex washer goes over the hub and rests against the case. By ingenious mechanical means, the protruding hex head is flared over the washer, making a permanent, turn-proof, water-tight seal.

Send for Bulletin 503



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Published for 74 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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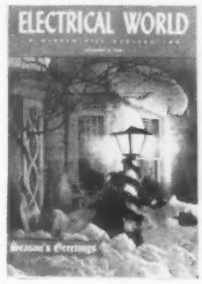
MERRY CHRISTMAS



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Cover by Earl Carver

COMING IN THE JANUARY 1 ISSUE

Microwaves—A Supplementary Communication Channel
Power Rectifiers For Steel Mills
Training Cable in Power Stations

SPLICE WITH TIME-TESTED OKONITE AND MANSON TAPES...

FOR MOISTURE-TIGHT, ELECTRICALLY-SOUND JOINTS

6 KEY QUESTIONS ABOUT RUBBER TAPES

1. Is it made with new Up-River Fine Para — the rubber selected for the finest cable insulations?
2. Is the rubber washed thoroughly to free it of impurities?
3. Is it expertly compounded with the finest ingredients under carefully controlled conditions?
4. Does it fuse readily into one solid mass?
5. Is it high in dielectric strength?
6. Is it high in insulation resistance?

Say "YES" 6 times if it's OKONITE Rubber Tape!

6 KEY QUESTIONS ABOUT FRICTION TAPES

1. Is it made with fresh, new rubber?
2. Is it truly adhesive and not merely sticky?
3. Is it mechanically strong and does it remain strong throughout a long period of service?
4. Is the standard ¾" width able to withstand a 45-pound pull?
5. Is it closely-woven to prevent "pin-holes"?
6. Has it good aging qualities?

Say "YES" 6 times if it's MANSON Friction Tape!

THE longest-lived splices they ever made — that's what more and more electrical men are getting from Okonite Rubber and Manson Friction Tapes!

Here's why. The combination of Okonite Rubber and Manson Friction Tapes provides every characteristic essential to making a permanent joint. For example, the Okonite Rubber Tape, when applied to the insulation, self-vulcanizes into one solid wall of fused material. This wall makes the joint impervious to moisture and equal both mechanically and electrically to the original insulation. There are *no separate layers* that can open up or permit moisture to enter.

The Manson Friction Tape keeps it that way. It adds the firmly-adhering, weather-resisting mechanical protection that a well-made joint must have. By providing consistently long-lived splices, Okonite Rubber and Manson Friction Tapes make possible the economy demanded by the high installation costs of today. Using the best tapes is the best policy when you consider the seriousness of an electrical failure and the doubling of installation expense whenever a joint has to be rebuilt.

To see for yourself what kind of splices you get with these time-tested tapes, simply use your business letterhead to request a sample of each — enough to make more than a dozen splices on #6 wire. Address The Okonite Company, Passaic, New Jersey.

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OKONITE OKONITE SINCE 1878 **and MANSON TAPES**

Budget Provision for Management Training

HAVE YOU made adequate provision for management training in your personnel budget for 1949? If you cannot answer this question in the affirmative, you are not really a progressive manager.

The list of utilities having foremanship conference programs is growing, but there are still many laggards. Potomac Electric Power Co, Wisconsin Electric Power Co, Louisiana Light & Power Co, and West Penn Power Co, whose plan is described in this issue of ELECTRICAL WORLD, are among those having highly successful management training. Foremanship conferences have now reached a high level of efficiency and have proved their worth beyond question. There is no longer any excuse to be without such a program.

We have no intention, however, of implying that a Foremanship Conference Program is the ultimate in management training. It can perhaps be classed only as an essential ingredient. Several others are necessary.

First, preparation for the future through recruitment of management material is needed. Few young engineers have been employed in the past three years compared with the losses incurred during and after the war. A survey made by ELECTRICAL WORLD in 1939 showed that about 60% of utility employees had 10 or more years of service. This indicated an age range from 30 years up. The war came and took its quota from the younger men. A study of ages of utility engineers in 1947 shows 97% of them over 30 years of age, 75% over 40, 30% over 50. Here is substantial proof that the first step in management training is at the employment desk.

Second, we should let down the bars to inter-company transfers of talented men. The size of utility systems and the complexity of operations require professionals with broad experience. Such men often need training not readily available in one utility because of departmental seniority and other restrictive practices. Often there are two men in one company available for one job opening. This is a typical illustration of an opportunity for an inter-company transfer. The obvious solution is the free movement of management material between utilities.

Third, there are always many openings for assistant supervisors and assistant department heads where young men can be given training and adequate opportunity to prove their ability. Delays in making appointments to such positions until men are over 40 lead to serious consequences. Men grow stale and discouraged when they are not given responsibility early in life. They certainly cannot inspire others when their development has been stifled by boredom.

There is little need of caution regarding an increase in management personnel to provide for the future. The rate of industry growth is sufficient proof of this fact. But the need for a large management staff in periods of strikes and other catastrophies is another equally important reason.

Now, take another look ahead to 1949.

Private Enterprise, Feeding On Itself

ON OCT 9, ELECTRICAL WORLD devoted both its editorial pages to the reproduction of a news story published originally by the Bradenton, Fla., *Herald*. The story described a meeting at which some of Bradenton's leading citizens heard an investment banker make his "pitch" for the municipalization of Bradenton's electric distribution system. We reprinted the piece without comment, under the headline *Private Enterprise Feeding on Itself*.

If there ever was a product of free enterprise—if there is any calling which can exist with any real meaning only under free competitive enterprise—it is the investment banker and his satellite, the securities dealer. If anyone is a part of the competitive enterprise structure we have in this country, it is the man referred to in the story we published Oct 9 as an editorial. Investment Banker Beh would be something else indeed under a totalitarian state in which private property was not permitted to exist.

This being so, we find something revolting in the practice in which Beh was engaging that night at the Country Club in Bradenton. There's no argument about Beh's right to preach municipalization up and down the land. That's one of the bonuses of a governmental system which nurtures free enterprise. And free enterprise itself could suffer no graver damage than for the Beh's to be denied the right to preach municipalization or any other legal type of social change.

But for a creature of free enterprise to exploit his rights in such a way as to destroy a cornerstone of the very system which permits him to follow the career he has chosen is a form of self-cannibalism and it isn't pretty.

Some day, perhaps, those who believe in free enterprise as a way of life for this country—and not just a way of life for one segment of our economy—will get together. Some day, perhaps, the whole of the privately owned electric power business will get together behind free enterprise everywhere—for all citizens, not just for the stockholders of one electric system. When this happens, perhaps the power people will join hands with their fellow targets—the housing people, the medical men, the people who handle money and credit, the insurance people, the retailers who have to compete with military post exchanges, the fertilizer people, the construction men who lose jobs to federal force account work, the rubber industry. Perhaps everyone who has a stake in free enterprise and who is struggling against unjustified government enterprise will join hands in an attempt to do something about it.

MVA? Far Away!

THEY WERE still counting the ballots early last month when Montana's Sen James E. Murray assured the nation that come the 81st Congress he'd be back in business at the old stand—promoting a Missouri Valley Authority, specifically, and valley authorities, in general.

Murray's been promoting an MVA for a long time—and never yet has there been any real hope of his success. This gives rise to the question of what the odds in his favor are this time. Right now the answer must be that they don't look good.

We've been inquiring of those who might know about the prospects for a Congressional validation in 1949 of MVA legislation. Those who should know—despite their unanimous failure in predicting the results of the balloting on Nov 2 — can't see anything more for MVA legislation than it got the last time it was up. What it got the last time—and every time before that—was a runaround.

But you don't have to talk to the experts to take a dim view of the forthcoming drive for an MVA. If you know what the letters mean, you know that both the Army Engineers and vast segments of the Interior Department are quite violently opposed to any more valley authorities. A third agency which swings a lot of weight in the Capitol Hill infighting is of the same opinion. Agriculture Secretary Charles F. Brannan made it pretty plain at a recent meeting in Washington that his agency wants no more authorities so long as TVA refuses to do business with the U. S. Soil Conservation Service in the Tennessee Valley. That makes three imposing members of Washington's executive-administrative lobby who don't want more VA's. It's hard to see where Murray and his strange collection of supporters are going to dig up the votes.

Registration of Engineers

WILLIAM N. CASEY, executive secretary of ASCE, pointed out recently that as of January, 1948, there were approximately 125,000 registered engineers in the United States. He estimated further that 50 to 60% of the engineers presumed to be qualified were registered. In closing he made the following significant statement:

"With the exception of one national society, the National Society of Professional Engineers, the professional engineering societies have not yet made state registration a prerequisite for membership. When the state laws shall achieve more reasonable uniformity in their minimum requirements and become more universal in application, there is a likelihood that registration may become one of the requirements for membership in other national engineering societies."

Since electrical and mechanical engineers are so often in fields exempt from registration, they have not been faced with the need for certification. But the pressure now being exerted in various ways by members of the NSPE should alert those not yet registered to the importance of the problem.

We do not take sides with those promoting registration as a requirement for superior grades of membership in national engineering societies. However, we do feel that such suggestions should be given serious consideration as one of the ways to promote professional recognition.

NEWS OF THE ELECTRICAL WORLD

The Electrical Week

One utility president who is optimistic about the future is H. B. Bryans, Philadelphia Electric Co. He believes his company has a prosperous area to serve and will prosper with it despite the heavy financing job which must be done . . . All load curtailments on the Kansas Power & Light Co system as a result of the explosion at its Tecumseh Plant ended 50 hours later. Cause of the explosion is still a mystery, but the plant was burning coal and a little oil at the time and not natural gas . . . At Detroit, AIEE's Welding Conference attracted 400 engineers, who learned that new welding systems not only produce better welds but also ease the utility's problem of serving them . . . And output climbed to a record 5,704,823,000 kwhr.

American producers of aluminum are unhappy. Western European countries have borrowed $26,000,000 from the Economic Cooperation Administration for the purchase of aluminum. Now some of the countries, particularly Great Britain, are buying Canadian aluminum at 16¢ a lb and selling it as scrap in this country for as much as 27¢. The scrap from their own countries is being sold to Russia for gold.

October production of television receivers by members of the Radio Manufacturers Association brought the total for the first ten months of the year to 583,349.

One embarrassing aspect of the recent circuit breaker failure at a Cleveland Electric Illuminating Co switchhouse was the cancellation of the utility's broadcast over a local radio station because of lack of power.

Stockpiles of bituminous coal maintained by electric utilities are the highest in history. On Nov 1 they were 38.8% higher than a year ago. The total was 23,875,065 tons or a 91 days' supply based upon October consumption.

Fighting off condemnation suits by public utility districts has been expensive for the Puget Sound Power & Light Co. A suit by the Snohomish County PUD, which ended in 1943, cost the utility $312,000. Another suit for substantially the same property is now underway. Vice-President Patrick Johnson testified in court recently that this suit will cost the company about the same amount.

A little air turbine and generator built into each fixture, and driven by the service air supply, are being used for fluorescent lighting of a British coal mine.

First allotment of steel to a public utility under the government's voluntary allocation program went to a natural gas carrier. The steel will be used in a pipe line to serve Atomic Energy Commission facilities at Oak Ridge, Tenn.

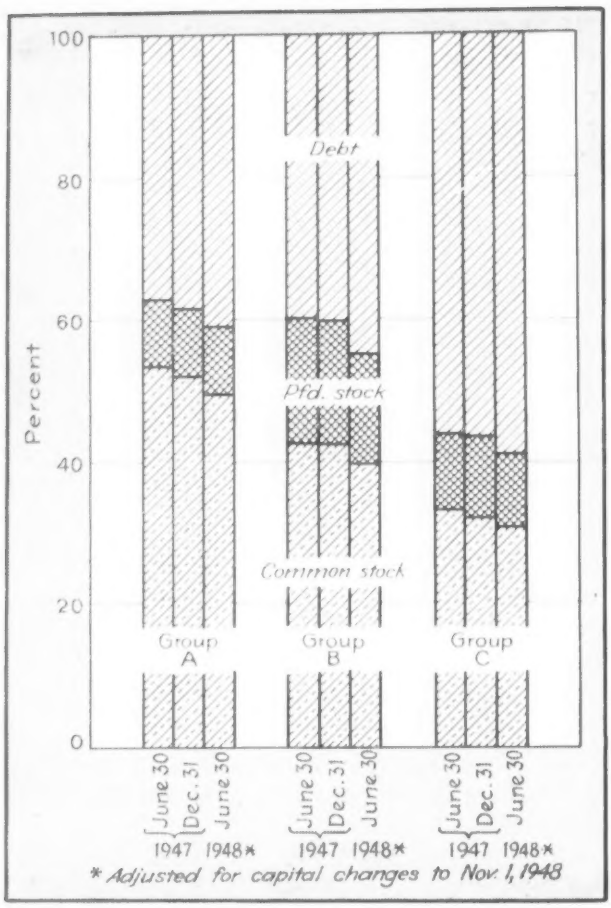
Lowest coal cost, instead of load center considerations, will probably increasingly dictate location of future plants.

Russia has signed a contract with Brush Electrical Engineering Co of England for 2,850 standard self-contained 50-kw diesel generating sets.

Notes From The News

The soft coal industry's Bituminous Coal Research, Inc, will spend $500,000 next year to create new and expand old markets for soft coal . . . Kentucky Utilities Co will sell its ice plants in ten Kentucky cities . . . Religious, charitable, and civic bodies in Britain will be allowed to use electric lights on public Christmas trees. No lighting will be permitted on commercial trees . . . To encourage customers to change fuses, Consolidated Edison Co of New York is distributing a booklet, "Don't Wait in the Dark," which explains that changing a fuse is just as easy as changing a bulb . . . Three times as much steel scrap as in prewar days will be required in the next year by the steel and foundry industries of the Pacific Coast . . . George H. Blake, president of Public Service Electric & Gas Co, has received an award from the Economic Council for the outstanding program his company conducted this year in furthering New Jersey interests.

In Washington State, they are starting to worry about floods because of the unusual amount of snow in the Cascade Mountains. So far the snows are six times as deep



EFFECT of financing to secure funds for construction on the capital structures of 41 electric utilities is evident in the chart. The companies were ranked in order of their average price-earnings ratios over a four-year period. Group A comprises the top third of the companies, B the middle, and C the bottom. The study was reported by Richard B. McEntire, Securities and Exchange commissioner

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as last year . . . Maj Gen Thomas B. Robins, retired Chief of Army Engineers in the Northwest, recently claimed that the heat lost at the Hanford atomic energy operation is sufficient to generate nearly half the present output of Grand Coulee and Bonneville Dams. . . . Plymouth, Ohio, municipal sent its customers their November bills marked "paid." . . . Toledo Edison Co was forced to draw 7,000 kw from outside sources on Nov 30 when demand reached 237,000 kw.

N. K. Winston Associates has announced that it will install television receivers in all homes that it has under construction in Long Island . . . A utility bill collector with a $300 weekly income for six years is under arrest. The man has been collecting bills for Consolidated Edison Co of New York without telling the utility about his collections or even being on its payroll . . . The strike which has kept the Utah copper mine of Kennecott Copper Corp out of production for eight weeks has caused the loss of 40,000 tons of badly needed copper . . . The University of California has a rain-making machine, but officials are doubtful as to its effectiveness. It was formerly used by the Kern River Indians.

Financial:

Public Service Co of Indiana plans to seek $24,000,000 in additional financing half in first mortage bonds and half in cumulative preferred stock . . . Gulf States Utilities Co, Beaumont, Tex., has FPC approval to issue $1,406,389 in unsecured notes, to mature within six months, as part of a loan agreement with Irving Trust Co of New York . . . Operating revenues of natural gas companies subject to FPC jurisdiction totaled $300,134,000 in 1947, an increase of 17% over 1946 . . . Seattle will sell a $9,000,000 block of City Light revenue bonds, to be dated next February, as part of a $36,000,000 issue authorized earlier in the year by the City Council . . . New England Electric System has cut its quarterly common stock dividend to 20¢ from 25¢ a share . . . Consolidated Edison Co of New York will seek approval of regulatory agencies to issue $28,000,000 of convertible debentures to be offered in voluntary exchange for the proposed common stock of the consolidated Long Island Lighting Co.

Construction:

The Electrical Service League of British Columbia is considering a proposal to erect a permanent electrical display building at Vancouver's Exhibition Park . . . April 1, 1954, has been set as the day production of electric power will begin at McNary Dam on the Columbia River . . . The pouring of concrete has started at the Clarks Hill Dam on the Savannah River . . . Manitoba Province, Canada, plans an immediate start on a dam and power plant at Pine Falls, 70 miles northeast of Winnipeg, on the Winnipeg River. Initial capacity is to be 38,000 hp . . . New power units which have gone into service include a 75,000-kw steam unit at the Harbor Steam Plant of Los Angeles Department of Water & Power, a 40,000-kw steam unit at the Port Jefferson Plant of Long Island Lighting Co, and a 25,000-hp hydro unit at the Seven Sisters Plant of Winnipeg Electric Co on the Winnipeg River.

One major utility system now has more than 15% reserve capacity. It is the Public Service Electric & Gas Co, Newark, which has just put into service two 100,000-kw units at its Sewaren Station. Another unit of the same size will go into operation late in 1949 . . . For years Consolidated Gas, Electric Light & Power Co of Baltimore has planned a transmission line through the Green Spring Valley of Baltimore County. An award of $56,000 has been made to two property owners who have already spent $40,700 fighting construction of the overhead line. They now have offered to settle for the latter amount if the utility will run 2.71 miles of the line underground.

Utility Head Links Optimism to Future

H. B. Bryans, President of Philadelphia Electric Co, Looks Confidently Ahead, Sees Favorable Conditions Keeping Earnings at Satisfactory Level

AN ELECTRIC COMPANY serving a city which is not only one of the nation's largest but whose growth from 1940 to 1947 was exceeded by only three others, a utility serving an area in which 386 of 446 varieties of American industry are located, one whose growth in industrial sales is proportionately greater than the average for the Industrial Northeast, one which is now fourth in volume of output but will still add 433,000 kw by the end of 1953, one whose residential customers had an average bill of 1,558 kwhr in 1947—Philadelphia Electric Co is all these companies rolled into one.

Satisfactory Earnings Foreseen

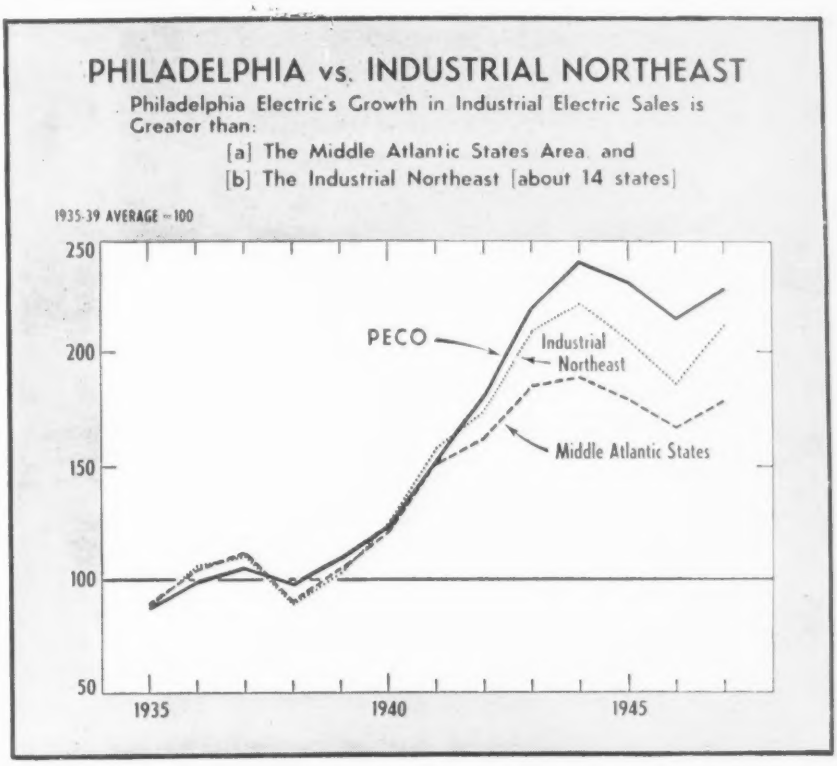
And because of this, PECO's president, H. B. Bryans, is optimistic. Not even the fact that his company must sell $115,000,000 in new securities in the next four years after having sold $100,000,000 in the past three can kill his optimism. He still believes that the characteristics of the area, together with the favorable elements in the company's future operations, point to a continuation of satisfactory earnings.

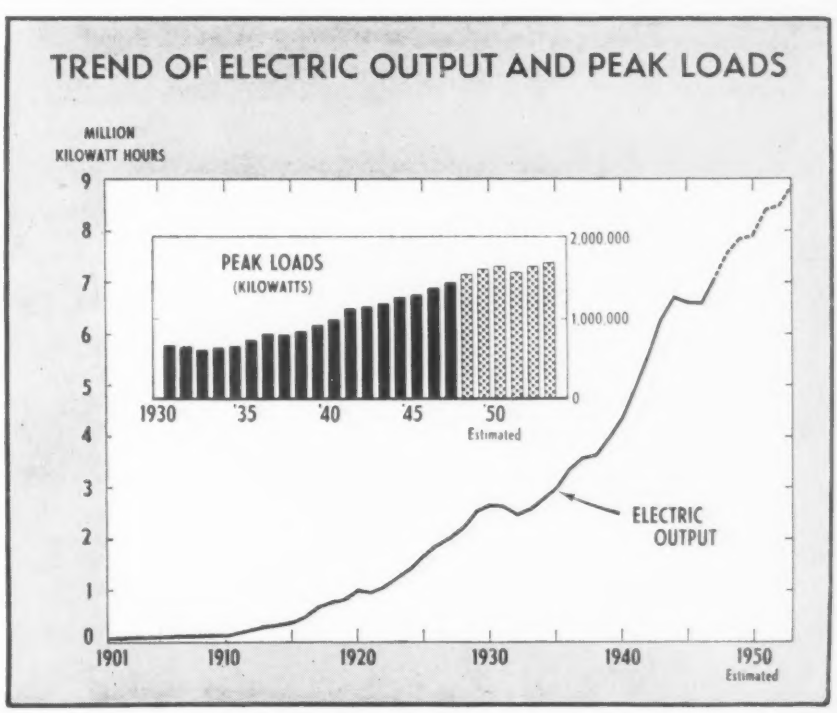
Bryans voiced his optimism in a recent address before the New York Society of Security Analysts. In his "Outlook for Philadelphia Electric Company," he listed the factors that have contributed to the success of the company and pointed out the steps that were being taken to continue its successful progress.

Population Growth Rapid

In population Philadelphia is growing, 16.4% from 1940 to 1947. Five cities showed greater percentage gains, San Francisco, Los Angeles, Washington, Baltimore, and Detroit. Only the first two of these and New York had a greater increase in numbers. Industry is flourishing. The 2,057 industrial establishments in the area used 3,225,600,000 kwhr in 1947, 106% more than industry took in 1939. A part of both the Middle Atlantic States and the Industrial Northeast, Philadelphia Electric's industrial electric sales are above the average in either of those areas (see chart).

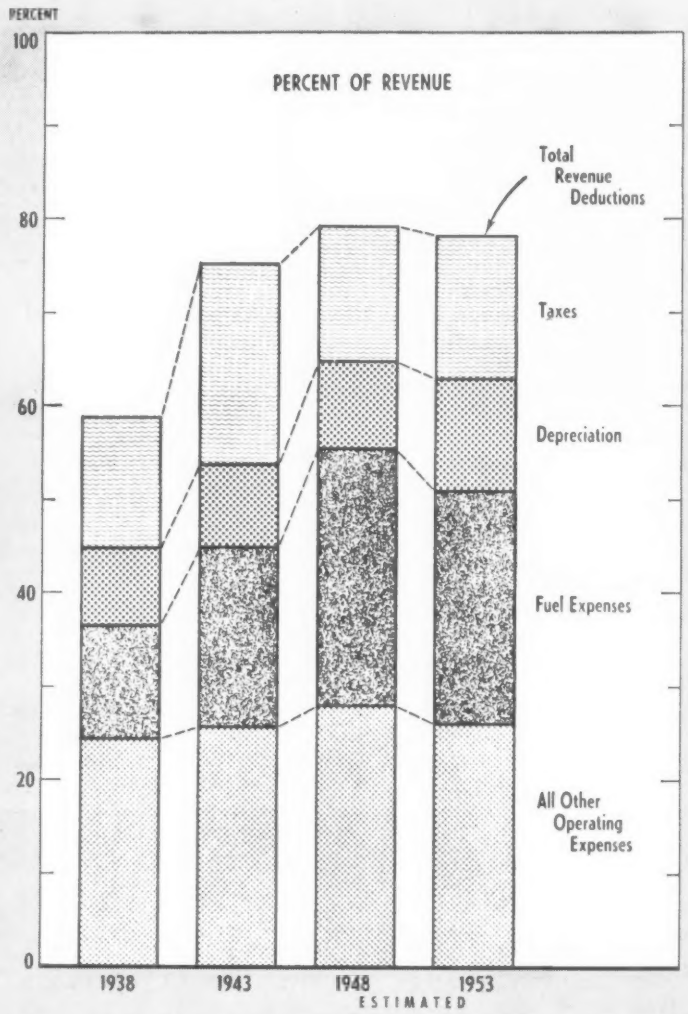
The growth of population and of industry, plus increased usage by both residential and industrial consumers, has been reflected in the demand made upon the company for electricity. In 1948 output will exceed 8,000,000,000 kwhr., just about double that of 1940 (see chart). Peak loads naturally have been rising. The residential electric business has grown steadily. Sales have risen from 297,000,000 kwhr in 1930 to an estimated 1,120,000,000 kwhr in 1948. And rising too has been





OPERATING RATIO IS EXPECTED TO IMPROVE

Operating Costs in Percent of Revenue have Risen Sharply Since 1938, Due Principally to Higher Fuel Costs, and to Taxes in the War Years. This Ratio is Expected to Decrease by 1953.



the average use per customer. This year it is expected to reach 1,630 kwhr, up 8% over 1947. In that year usage was 1,558 kwhr—8% higher than the industry average of 1,438 kwhr and 12% above the average of 1,386 kwhr for the 12 largest metropolitan companies.

Though all electric appliances have contributed to the demand by residential customers, two ranges and water heaters, have accounted for about one third of the increase. The company has attempted to add two ranges for each water heater installed. This provides better balance of loading on the distribution system, with greater efficiency and economy in utilizing the system. Saturation is now 11% for ranges and 7% for water heaters.

Looking to the future, Philadelphia Electric has installed two heat pumps to gain information as a first step in developing this potential market.

Commercial sales have also risen—54% from 1945 to 1948. This results partly from an 11% growth in the number of customers but mainly from the ever increasing use of air conditioning, better lighting, and a variety of power and heating appliances.

But faster than sales, operating expenses have been rising. In 1938 total operating revenue deductions absorbed 59% of operating revenue; this year they will absorb 79% (see chart). This means operating income has fallen from 41.3% to 21.9% of operating revenue. But it is believed that in 1953 there will be a slight improvement.

This belief is based in part on the expected economies which should result from new and more efficient generating equipment. By 1953, it is estimated, the coal rate will be 13% lower than it is today—with a resultant savings in fuel expense of approximately $4,500,000 at present fuel prices.

Other economies will be reflected in transmission and distribution expense as a result of more efficient operation. The customer's accounting cost, now one of the lowest in the country, $3.41 a year per customer, is 23% lower than the average for ten large metropolitan companies. Further savings will result from greater use of machine operations.

The latest generating capacity to be installed includes 132,000 kw in 1949 at Barbadoes Station, 195,000 kw by 1950 at Richmond Station, 40,000 kw in 1952 at Delaware Station, and 66,000 kw in 1953 at Cromby Station. The total cost of generating stations and other electric facilities is estimated at $272,000,000 for the seven-year period 1947–1953. Expenditures for gas plant and other non-electric items will raise the total cost of expansion to $322,000,000.

It is estimated that $107,000,000 of this program will be financed with cash from the company's operations, principally from depreciation reserve funds and reinvestment of earnings. Of the remaining $215,000,000, $100,000,000 has already been raised through the sale of $55,000,000 in bonds and $45,000,000 in preferred stock. It is too early to say how the $115,000,000 still needed will be raised, but both debt and equity securities will be issued.

The company's policy aims to keep a sound and conservative capital structure, with debt obligations on the lower side of 50% and with common stock equity of 35% or more. An effort is also made to keep the policy simple in form so that it can be readily understood by all investors.

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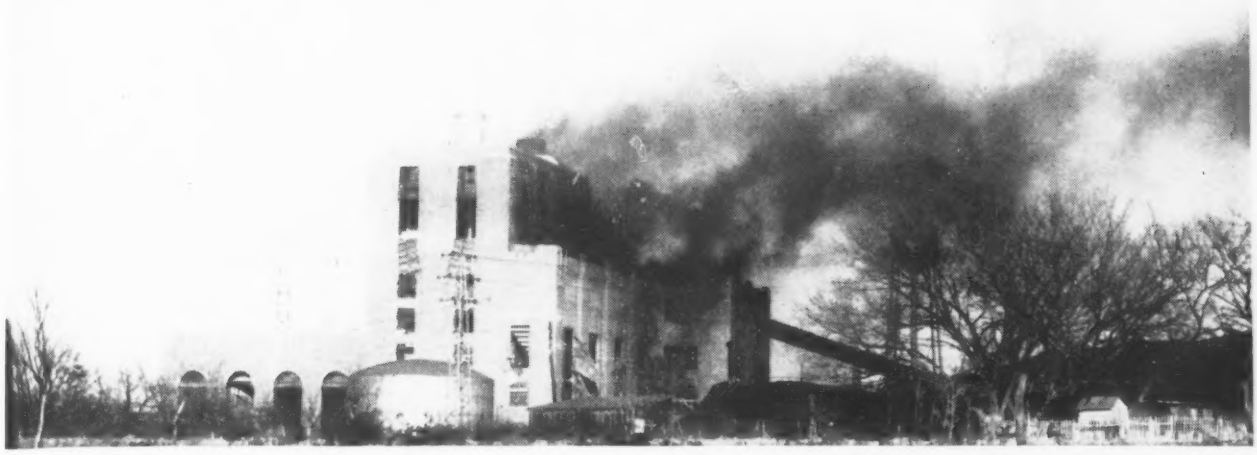
Abolition of New Mexico PSC to Be Proposed

Abolition of the Public Service Commission of New Mexico and the transfer of its duties to the Corporation Commission have been advocated by Ingram Pickett, who takes office Jan 1 as a member of the Corporation Commission. He said a bill to put the change into effect will be introduced into the state legislature on the first day of its session in January.

The Public Service Commission, established by law only a few years ago, has jurisdiction over electric, gas, and water utilities. Members are appointed by the governor.



TECUMSEH PLANT of Kansas Power & Light Co as it looked shortly after explosion of Dec 9. Fire has broken out, and smoke and steam pour from the old section of the building, where explosion originated. Installation of 30,000-kw unit was going on in new section

Kansas P & L Restores All Service Disrupted by Tecumseh Explosion

ALL LOAD CURTAILMENTS on the Kansas Power & Light Co system resulting from last week's explosions (Dec 9) at the Tecumseh generating station were ended about 50 hours later, an official told ELECTRICAL WORLD this week. But no cause for the blasts had yet been discovered.

Eight men were killed and a ninth died of injuries as a result of the explosions which rocked the 53,400-kw station five miles from Topeka and the fire that followed. Sixteen injured men were taken to Topeka hospitals. "Three or four" remained there at midweek (Dec 14). None of these was in critical condition, although "one or two" were badly burned. Six of the dead were utilitiy employees. Three were employed by a contractor completing installation of a 30,000-kw turbine in an addition to the plant.

Damage to the four turbines and six boilers in service at Tecumseh was far less than had been feared at first. The largest unit, a 25,000-kw machine, was back on the line under partial load 23 hours after the disaster. The second to return to service, a 15,000-kw unit, was put on about 48 hours after the explosion. Two 6,700-kw machines still had not returned to service Dec 14, but this was because there was no boiler capacity to serve them not because of turbine damage, the spokesman said.

Worst damage to the machinery was suffered by the controls of four older boilers. It resulted primarily from fire. The KP&L spokesman said certain new equipment had been ordered to restore them to service. He would hazard no guess as to when repairs would be completed.

The utility does not expect the explosion to cause any delay in energizing the new turbine. KP&L still hopes to get the unit on the line in February. The turbine will be served by a 285,000 lb per hour boiler, which was completed last July and was operating Dec 9.

Within two hours after the disaster circuits in Topeka were energized. All domestic and commercial load was picked up quickly, but industrials were unserved until late Dec. 11. Help was

RESCUE WORKERS search wrecked boiler room of Tecumseh Plant. In right panel, relatives of plant workers wait for news of their safety

obtained from Kansas Gas & Electric Co, whose 154-kv line from Midian to the Nebraska border passes near Tecumseh. KP&L officials would not specify the extent to which the KG&E system was drawn upon. Tecumseh was carrying about 50,000 kw at the time of the first blast, 3:20 PM (CST).

Fire which followed the first explosion was controlled within about one hour and was fairly well localized. Part of the roof and the skylights were blown away, and all of the large steel-framed windows were shattered. One was reported blown 100 ft away. Within the plant, particularly in the basement, concrete and steel were badly shattered. Debris hampered the search for victims and the examination of equipment for some time. Fire-fighting equipment, nurses, doctors, and ambulances were brought hastily to the plant. Most of the dead and some injured men were trapped in the fire-enveloped section, some for as long as an hour.

Early suppositions that the blast was caused by leakage of natural gas appear to be inaccurate. The plant is equipped to burn coal, oil, or natural gas, but was operating mostly on coal and a little oil Dec 9.

No estimate of the disaster's cost was available at mid-week. The company said it was covered by insurance.

"The public was wonderful," the spokesman said in commenting on reaction to the disaster and service curtailment. The company bought radio time to notify its customers of the situation and the progress made in service restoration.

Load Magazine Photo

J. R. NORTH, right, Commonwealth & Southern Corp, a national director of AIEE, discusses Welding Conference program with Marvin Horne, George R. Horne & Co, chairman of Michigan Section of AIEE

Load Magazine Photo

UTILITY MEN took active part in AIEE Welding Conference. Among them were, left to right, C. N. Clark, Duquesne Light Co, Pittsburgh, chairman of publication committee of the conference; E. H. Vedder, Westinghouse Electric Corp, general chairman of the conference; A. W. Brown and S. E. Johnson, Illinois Northern Utilities Co; J. H. Cooper, Taylor Winfield Corp; E. F. Dissmeyer, Commonwealth & Southern Corp; H W. Tietze, Public Service Electric & Gas Co, Newark, N. J.; and H. B. Wood, Duquesne Light

New Welding Systems That Ease Power Supply Problems Described

NEWLY DEVELOPED welding systems that produce better welds and ease the utility's problem of electric power supply for big loads of resistance welders created lively discussion at an AIEE Welding Conference Dec 6-8, at Detroit. E. H. Vedder, general chairman, reported that more than 400 engineers registered to hear and discuss the 30-odd technical papers scheduled by G. W. Garman, program chairman.

Several recent types of resistance welding systems that control wave shape for better welding of aluminum and other metals include (1) low frequency systems of 5 to 12 cycles, both for three and single phase; (2) single-phase welders controlled by electronic "slope control"; and (3) three-phase systems that draw power from the line without distortion by using disk-type metallic rectifiers. One newly devised inert atmosphere welding system has an idling voltage of only 25-35 v, and automatic control handles the flow of gas, cooling water, and power at proper time at beginning and end of a weld.

Instead of a sine wave, the recently developed three-phase converter produces a wave form that can be changed to suit the welding job, said F. L. Brandt, Thomson Electric Welder Co. He discussed results of experimental welding using alternating impulses with very short zero gaps resulting in a simulated 12-cycle frequency.

Electrical advantages of three-phase low-frequency welding over conventional single-phase systems, said J. L. Solomon, Sciaky Bros, Inc, include (1) substantially less power demand for a specific welding job; (2) line currents of ¼ to ⅙ that for single phase machines with normal throats; (3) power factor of above 85%; (4) equal three-phase line currents, thus producing uniform heating on all three phases of the transformers and distribution system; and (5) relatively constant secondary current, even if heavy steel sections are placed in the throat. In the actual welding, there is less tendency for expulsion of metal, greater tip life, and less electrode pick-up when welding aluminum and magnesium.

A new single-phase, 12-cycle low-frequency system will be commercially available soon, said C. B. Stadum, Westinghouse Electric Corp. Like the three-phase systems it (1) requires less kva demand, (2) provides low rate of rise of welding current, and (3) is easily controlled for joining different types of heavier materials. In general, although a little less efficient, the new design will be simpler and less costly than three-phase types.

The effect of controlling the slope of the envelope of the current of a standard single-phase spot welder during the first few cycles of a weld is being studied, said Ivar W. Johnson, General Electric Co. Tests on aluminum show that with the initial current suppressed, the current density during the first cycle is about one third that without "slope control." Thus the temperature at the point of contact of electrodes and the work is lower, and the aluminum pick-up is greatly reduced. For example, 20 to 30 times as many spot welds could be made on 24 ST Alclad 0.025 to 0.081 in. thick before sticking occurred.

Because of inherent advantages,

three-phase metallic rectifier welding will steadily find wider application, said C. E. Smith, Taylor Winfield Corp. The rectifier system: (1) demands reactive power only during the two or three cycle current-rise period; (2) has a power factor of about 99%, as compared to 20 to 40% for standard single-phase welders; (3) draws a weld current limited only by the d-c resistance in the system. Also since this is a resistance load, the size of the throat has little effect on the kva demand.

Problems in Serving Welders

Major utility problems in supplying welder loads said H. B. Wood, Duquesne Light Co, include flicker, adequate voltage at welder terminals, and low revenue from the high investment cost because of fluctuating loads. Where flicker is too great or voltage inadequate some possible solutions are to (1) replace 2300/230-v transformer with 4,000/230-v unit, (2) connect welder to three-phase star-delta bank, (3) replace primary circuit conductors; (4) install separate feed, and (5) install series capacitors in primary feed.

Cost of new or modified plant distribution system to eliminate need of special welders may cost less than the extra cost of special welders, reported W. K. Boice, General Electric Co. Combination of motor or heating loads with welders will greatly reduce system costs chargeable to welders. Power loads and welder loads seldom interfere with one another, and power loads can make use of the excess rms current capacity of welding substation.

Test Results Reported

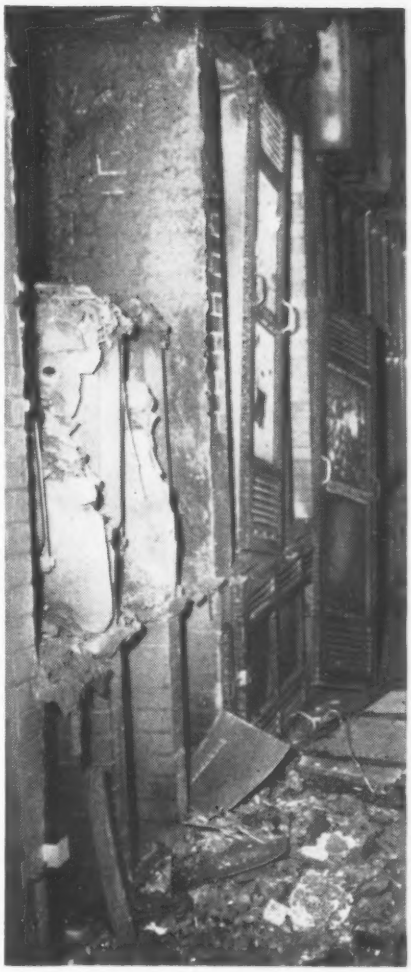
Welders with minimum kva demands are the only solution for many problems where welders are used in remote areas, said E. F. Dissmeyer, Commonwealth & Southern Corp. Tests were made on two single-phase welders side by side in the same plant doing the same work. One had 200 kva demand, the other 75 kva. The 200-kva machine had a deep throat while the other utilized a series circuit, thus eliminating the effect of the metal in the throat. As a result reactance in the secondary circuit was greatly reduced. Thus the 75-kva machine would be preferable both for user and power company. It produces only $\frac{1}{3}$ the voltage drop, and thermal requirements of transformers, lines, and users' distribution system would be correspondingly less. Voltage fluctuations inside the plant itself may be just as important as on the outside.

In voltage dip calculations for single-phase welder loads, the change in reactance of conductors caused by interaction of phase currents must be considered, said H. Watson Tietze, Public Service Electric & Gas Co, Newark.

Largest single item in inert gas-shielded arc-welding of aluminum is cost of shielding gas, said G. O. Hoglund, Aluminum Co of America. For example, a 15.5 gal container, 7½ in. dia. of ⅜ in. thick material requires about 4 cu ft of argon gas for shielding. This gas costs about 32 to 40¢ per container. Cost includes electrodes, filler metal, and shielding gas but not the labor cost for making the joint or doing the work.

By using electronic control for switching a 280-kw dummy load, A. W. Brown and S. E. Johnson, Illinois Northern Utilities Co, explained how objectionable flicker was overcome at the Conco Engineering Works, Mendota, Ill.

Chairmen for the six sessions were R. C. McMaster, Battelle Memorial Institute; E. F. Steinert, Westinghouse Electric Corp; G. W. Garman, G. M. Chute, and C. M. Rhoades, Jr., all of General Electric Co; and C. N. Clark, Duquesne Light Co.



CIRCUIT BREAKER section of Switchhouse C of Cleveland Electric Illuminating Co as it appeared following failure on Dec 9

Bus Fault Cuts Service to Section of Cleveland

The second failure within a year at Switchhouse C of the Lake Shore Plant of Cleveland Electric Illuminating Co blacked out a large portion of downtown and eastern Cleveland and suburbs on Dec 9. Service failed at 8:56 PM and remained off in some sections until 1 AM the next day. About 40,000 customers were affected, with some 6,000 still without service at midnight.

Cause of the latest failure was presumed to be a bus fault. An explosion and fire followed. Heat generated in the fault was of such intensity as to vaporize and gasify the copper in the breakers. A number of oil circuit breakers and equipment on one floor and the building proper on the reactor floor directly underneath were damaged.

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EEI Publicity Program in Hands of Committee

Edison Electric Institute's public information program this week lay in the laps of the EEI Advisory Committee. It got there because it will involve an increase in dues of about 30% if last week's action of the directors is carried out. The directors appropriated $150,000 for the program in 1949. Actions which involve dues increases must be approved by the Advisory Committee.

No new developments on the proposed national public information program came out of last week's directors meeting, it was learned. Members who had been opposed to such a program—and who succeeded in preventing the adoption of a national program last fall—reiterated their opposition last week.

Agreement was reached on an agency to handle the campaign, but no announcement will be made until contracts are signed. No EEI staff additions are anticipated before the Advisory Committee acts.

Much of the early effort will be concentrated on the "receiving" end of the EEI-member information program. Efforts will be made to have members make the best possible use of information supplied them. Considerable regional activity aimed at this result may be anticipated, it was learned. Such activity is part of the public information program approved last fall when EEI directors met at Cleveland.

EEI directors last week also appropriated funds for salary and expenses of a research director, whose first job will be to survey the research activities of member companies. No director has

yet been chosen. Organization of a committee to supervise the program is expected to be completed within a few weeks.

A new EEI activity will be a survey of methods used by electric utilities to test applicants for employment. The survey will be carried out by the Industrial Relations Committee.

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Truman Ready to Push Seaway-Power Project

There'll be no compromise over development of the St. Lawrence River. Primarily concerned with opening the stream to ocean-going shipping, proponents of the seaway-power plan will ask Congress early next year to sanction U. S.-Canadian construction of the project. Proposed single-purpose power development will be shelved.

President Truman made this clear at a press conference last week. For the second time in two weeks, he emphasized his preference for a dual-purpose seaway over plans for hydro power production only.

He thus slammed the door in the faces of those advocating a New York-Province of Ontario proposal to construct hydroelectric generating facilities at the International Rapids. Backers of this plan had hoped to convince the President that power needs of the area, especially in Canada, have become so critical as to require earliest possible hydroelectric development of the St. Lawrence. This could be best accomplished, they argued, under the New York-Ontario plans, now before the Federal Power Commission.

But the President apparently is convinced that he can get approval of the seaway and power project through the new Congress, perhaps without much delay for debate. This does not square with the views of seaway opponents, who are preparing for a knockdown battle.

Meanwhile FPC has been marking time on the power development project. It is awaiting the report of a staff examiner, who conducted the recent hearings on the New York-Ontario scheme. Even should FPC approve, the project is likely to die. It cannot be considered by the International Joint Commission, which has the final say, until the State Department asks IJC to take up the proposal. And State will not do that without the President's approval.

New cost estimates for the seaway and power development also came to light last week. Sen Alexander Wiley, Wisconsin Republican and an ardent backer of the seaway, said that the Army Engineers now place the construction cost of the project, with a 27-ft shipping channel, at $966,678,000.

Other Army estimates, all based on July, 1948, prices, set seaway costs at $1,212,241,000 if a 30-ft channel is provided, and at $1,919,191,000 with a 35-ft channel. The Engineers figured the cost of the New York-Ontario development at $451,615,000, of which $182,553,000 would be required for joint power and navigation facilities. New York and Ontario proposed to construct navigation channels around their power development in order not to prevent possible future improvement of the St. Lawrence for shipping.

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To Add 60,000-kw Unit

Public Service Co of Indiana will add a 60,000-kw unit to its Edwardsport plant on the White River near Bicknell. It will bring the plant's total capacity to 185,000 kw.

MEETINGS

National Electrical Manufacturers Association—Winter Convention, Edgewater Beach Hotel, Chicago, March 13-18. W. J. Donald, managing director, 155 East 44th St, New York 17, N. Y.

Oklahoma Utilities Association—Annual Convention, Hotel Tulsa, Tulsa, March 17-18. Kate A. Niblack, secretary, 625-626 Biltmore Hotel, Oklahoma City 2, Okla.

Edison Electric Institute—Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 5-7. H. S. Bennion, managing director, 420 Lexington Ave, New York 17, N. Y.

Midwest Power Conference—Sherman Hotel, Chicago, April 18-20. Roland A. Budenholzer, conference director, Illinois Institute of Technology, 3300 South Federal St, Chicago 16, Ill.

PREVIOUSLY LISTED

Canadian Electrical Association—Winter Conference, Chateau Frontenac, Quebec, January 17-19.

Edison Electric Institute—Accident Prevention Committee, Book-Cadillac Hotel, Detroit, January 24-25; Transmission & Distribution Committee, Netherland Plaza Hotel, Cincinnati, February 10-11; Electrical Equipment Committee, New Jefferson Hotel, St. Louis, February 14-15; Engineering Committees, Edgewater Beach Hotel, Chicago, May 2-4; Annual Meeting, Traymore Hotel, Atlantic City, June 1-3.

American Institute of Electrical Engineers—Winter General Meeting, Statler Hotel, New York, January 31-February 4.

Missouri Valley Electric Association—Power Sales Conference, February 10-11; Sales & Rural Committee, February 25; Accounting Committee, March 7; Engineering Conference, April 6-8; Rural Roundtable, May 4; Sales & Rural Conference, May 5-6; Accounting Conference, May 12-13; Annual Meeting, May 17. All meetings at the Hotel President, Kansas City, Mo.

Pennsylvania Electric Association—Transmission & Distribution Committee, Benjamin Franklin Hotel, Philadelphia, February 24-25.

American Society for Testing Materials—Spring Meeting and Committee Week, Edgewater Beach Hotel, Chicago, February 28-March 4; Annual Meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 27-July 1.

International Lighting Exposition and Conference—Stevens Hotel, Chicago, March 29-April 1.

SEC RULINGS

Kentucky Utilities Co, a subsidiary of The Middle West Corp, has been authorized to sell to Western Kentucky Gas Co, a non-affiliated company, all of Kentucky's gas utility properties located in and about the City of Danville, Ky, pursuant to a contract dated Sept 21, 1948, for a cash consideration of $155,500 subject to closing adjustments. (Release No. 8653).

Alabama Power Co has been authorized to sell $12,000,000 of first mortgage bonds, due 1978, at competitive bidding. The company will use the funds to finance property additions and betterments or to discharge obligations. (Release No. 8663).

Buffalo Niagara Electric Corp has been allowed to borrow $5,000,000 from certain banks for property additions and improvements. The borrowings will be made on 2½% promissory notes, due Dec 21, 1950. (Release No. 8661).

Queens Borough Gas & Electric Co has been granted authority to borrow $1,500,000 on unsecured notes from three commercial banks. The sum will retire that amount of outstanding loans. (Release No. 8671).

Oklahoma Gas & Electric Co has been authorized to sell $7,500,000 in first mortgage bonds. The securities will be offered at competitive bidding, and proceeds will be used to retire $5,500,000 in current obligations, with the balance financing new construction. (Release No. 8677).

General Public Utilities Corp, New York holding company, has been granted permission to make cash contributions of not more than $300,000 to its subsidiary, the Rochester Gas & Electric Corp. (Release No. 8670).

New Bedford (Mass.) Gas & Edison Light Co has received authority to sell at competitive bidding $5,000,000 in unsecured notes. Half of the proceeds will retire bank loans, the balance restoring company funds spent for construction. (Release No. 8695).

Electric Bond & Share Co has been granted permission to distribute 72,612 shares of Carolina Power & Light Co common stock as a dividend on its own common stock. This dividend will be payable on Dec 24 to stockholders of record at the close of business Dec 2 at the rate of 1/60 of a share of Carolina stock for each share of Electric Bond stock then held. No certificates or script for fractional shares will be issued, but cash at the rate of 50 cents per share will be paid on each Electric Bond common share. These distributions are part of the company's plan to dispose of all of its 428,508 shares of Carolina common in order to comply with the Holding Company Act. The commission recently permitted the company to sell 350,000 shares of Carolina stock in a negotiated transaction with underwriters. (Release No. 8696).

Pennsylvania Electric Co has been allowed to sell to its parent, Associated Electric Co, an additional 80,000 shares of its $20 par common stock for $1,600,000.

Power Rationing May Be Ordered in Northwest

Rationing of peak-period electricity throughout the Pacific Northwest was a possibility last week because of indications that the voluntary curtailment program would not be enough to avert a power shortage.

Oregon, Washington, and Idaho Dec 8 ordered private utilities to present within ten days "a conservation program designed to meet effectively the electrical deficiencies, present and anticipated." Such a program would supplement rather than supplant the present one, under which industrial, commercial, and domestic users are asked to discontinue or reduce the use of power between 4:30 and 6:30 PM.

The voluntary curtailment program has been described by operators as "moderately successful." Puget Sound Power & Light estimated that between 30,000 and 35,000 kw had been cut off its peak loads, while Seattle City Light savings were estimated at between 18,000 and 20,000 kw. But November reports showed the Puget Sound peak 4.6% above a year ago and the City Light peak up 6.9%.

Most of the savings have been in the industrial load, which is partly covered by interruptible contracts.

George H. Flagg, Oregon Public Utilities Commissioner, saw a "definite possibility that the combined generating facilities of the Northwest Power Pool will not be sufficient to carry the required load for the years 1948-49 through 1951 during the hours of peak consumption."

Director Andrew J. Zimmerman, Washington Department of Public Utilities, added there even exists danger of a shortage of firm power at other times than peak load periods.

Operation of some industries only at night might become necessary, Dr. Paul J. Raver, Bonneville Power Administrator, said. He reported one concern already was being lined up to use power on a night basis only.

The power pool consists of BPA, municipal plants in Seattle and Tacoma, and seven private power companies. In the pool area 90% of the power supply is hydro and 10% steam-generated. The 88 plants within the pool have a capacity of 3,900,000 kw. But the estimated peak load for this winter is 4,100,000 kw.

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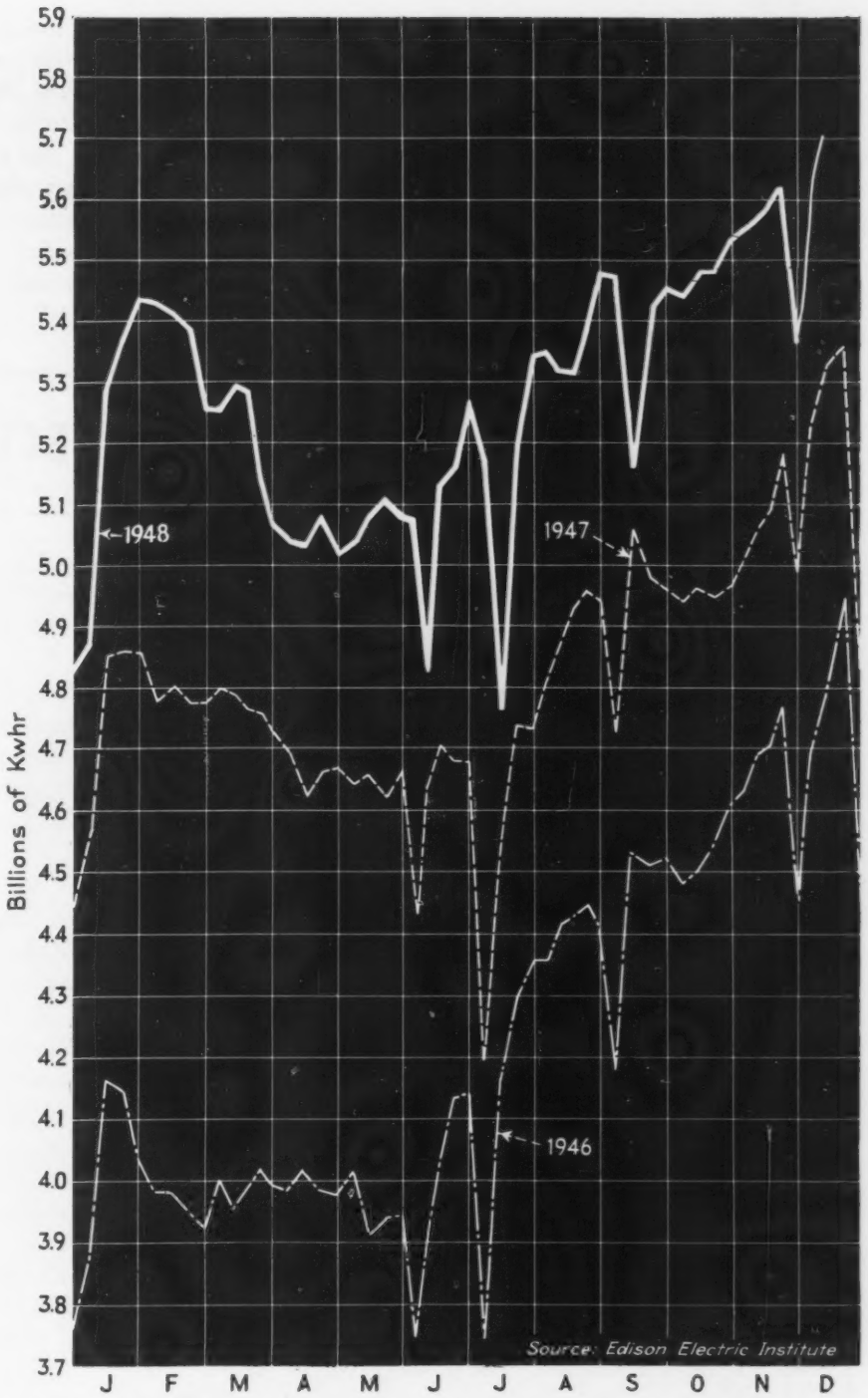
Voters Reject Utilities Tax

In a special election voters of Avon Park, Fla., rejected the city's proposal for a tax on utilities.



5.7 Billion Kwhr Is New Output Record

How much was output of electrical energy curtailed last week because of voluntary curtailment, Daylight Saving Time, interruption of power to industrial customers, and equipment breakdowns? This unanswerable question holds the key to how much higher output would have been for the week ended Dec 11. As it was, another record was set with a total of 5,704,823,000 kwhr.

The increase over last year was only 7.1%. This would indicate that this year's peak week is not likely to exceed 5.8 billion kwhr.

Another factor which is beginning to influence output is the slackening of work in industry. Though still far from serious, this slow down will reduce power consumption.

Weekly Output, Millions Kwhr

1948		1947		1946	
Dec 11	5,705	Dec 13	5,327	Dec 14	4,778
Dec 4	5,646	Dec 6	5,218	Dec 7	4,673
Nov 27	5,349	Nov 29	4,983	Nov 30	4,448

Percent Change from Previous Year

	Dec 11	Dec 4	Nov 27
New England	+ 1.5	+ 3.0	+ 3.1
Mid-Atlantic	+ 3.7	+ 4.9	+ 3.6
Central Industrial	+ 6.3	+ 7.4	+ 6.7
West Central	+ 9.0	+10.3	+ 7.8
Southern States	+ 8.9	+10.6	+ 8.9
Rocky Mountain	+15.7	+14.6	+17.3
Pacific Coast	+ 9.2	+ 9.4	+ 9.4
Total United States	+ 7.1	+ 8.2	+ 7.3

WASHINGTON COMMENT

WILLIAM B. WHICHARD

REPEATEDLY, since his re-election, President Truman has pledged that his will be no anti-business type of administration during the next four years. Political statements being what they are, this one aroused no outburst of industry enthusiasm. It proved only that the President had observed the post-election gyrations of the stock market.

At least it indicated, if indication were needed, that Mr. Truman is concerned with the well-being of American business. But there hasn't been the slightest hint that the Administration, or any segment thereof, is approaching serious problems of industry-government relations with new sympathy or understanding. In fact, the single development of note along these lines contains a threat of just the reverse.

Arthur M. Hill's resignation as chairman of National Security Resources Board is being interpreted that way in some quarters. Certainly if the system of consulting with industry, set up by Hill as standard NSRB procedure, departs with him, business and the Administration will be further than ever from mutual understanding. It does not necessarily follow, of course, that NSRB will drop this practice. Indeed, it is hard to conceive just how the agency can function without such cooperation as the conference system produces.

But it was this very procedure which threw on Hill some of the pressures which must have contributed, at least in part, to his decision to resign.

It's easy to understand that he might have become fed up with some of the criticism of NSRB's reliance upon industry assistance. A typical instance occurred last October.

At a time when most of the Administration was in high dudgeon over what it termed "witch hunts," the Federal Power Commission began seeing skeletons in NSRB closets. In the most formal terms, FPC complained to Hill that NSRB's chief utilities consultant, through his private business connections, had received utility fees. In less excited tones FPC revealed the real hair under its shirt—it felt it had been snubbed by one of NSRB's utility advisory committees.

As Hill tartly pointed out, he had previously been informed of his utility consultant's business affairs—by the consultant himself before he took the NSRB job without compensation. Hill dismissed FPC's other complaint as only slightly more legitimate. FPC had been and would continue to be informed of activities of the advisory group in question.

An element in FPC long has resented the wartime record of the Office of War Utilities. This group always felt that OWU picked up and ran off with a ball that FPC should logically have carried. Regardless of the merits of that opinion, it explains the uneasiness felt in FPC over NSRB and its use of former OWU men and methods.

But, in addition to establishing a new low for interagency sniping, the FPC assault had more serious implications. A series of similar attacks might well prejudice the further use of industry-government consultation by NSRB or any other federal agency.

The government would be the big loser. It has not yet developed other means of obtaining industry aid and information which can produce comparable results.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Feeder regulators have traditionally had buck as well as boost. In times like these there must be much more need for boost than for buck. Maybe the buck is dispensable.

Gas-proofing of fluorescent lighting units in a coal-gas compressor station was achieved by cutting openings for the fixtures in the flat roof, glazing them with armorplate glass and doing the lamp maintenance from the roof.

Three-phase capacitor banks should not have single-phase circuit opening devices ahead of them; otherwise there may be overvoltages or motor reversals.

Reactive kilovars on distribution feeders average, in a broad way, one-third the circuit's peak kva. For optimum behavior the capacitor kva should amount to this same one-third.

Boiler design is currently reflecting the conclusion that earlier slagging and tapering output troubles could be overcome by reducing gas velocities and achieving lower gas exit temperature. It takes more volume and more surface.

Mechanization of operations is an effective antidote for high costs but the associated manpower must not fritter away all the gains in correspondingly lowered manhour output.

Weed killers are proving invisible and effective in preventing growth of "horsetail" up through the crushed stone commonly placed around oil-filled equipment in outdoor substations. Discolored used oil is an unsightly alternative.

Grounding outlay can be wasteful if overdone where conditions are favorable. Savings come from concentrating the expenditures on unfavorable situations. Nobody knows enough about grounding.

First Oilostatic Submarine Cable Solves Hudson River Crossing

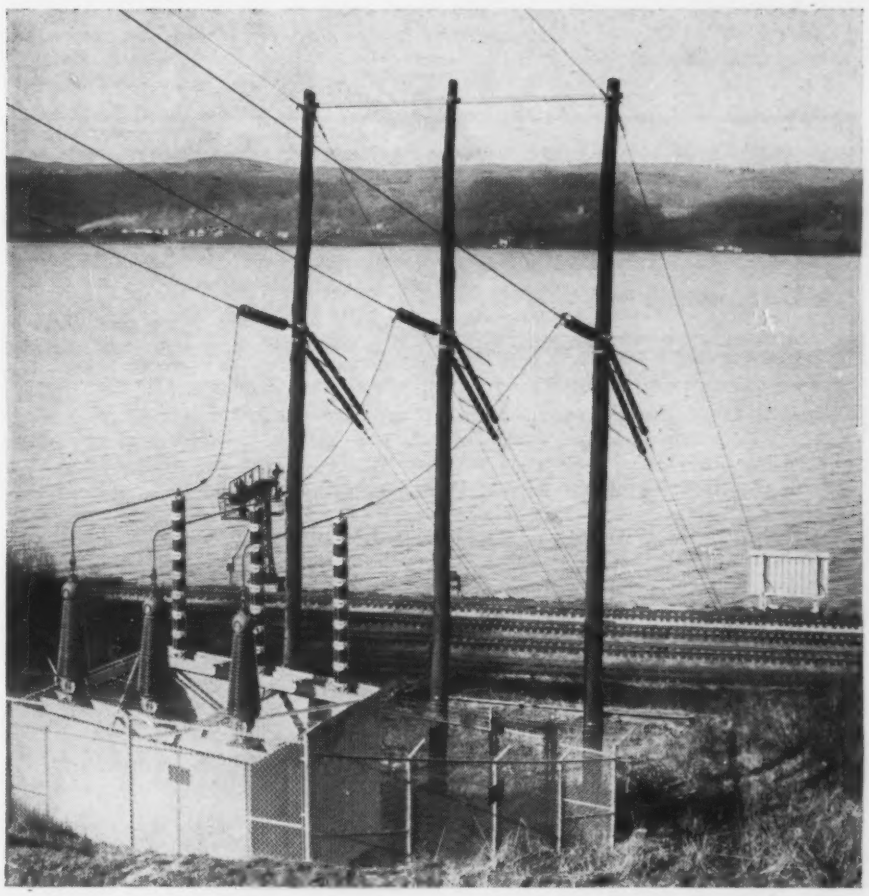
Three 3,675-ft cable lengths pulled simultaneously into 6-in. pipe on river bed. Resulting submarine crossing proves less costly, more reliable than aerial crossing. Cable to operate initially at 110 kv but is suitable for 132-kv use

GEORGE H. LANDIS
Chief Engineer
and
J. G. HLAVAC
Transmission Engineer
Central Hudson Gas & Electric Corp
Poughkeepsie, N. Y.

THE FIRST application of Oilostatic pipe-type cable to submarine service has recently been made on the system of the Central Hudson Gas & Electric Corp below Poughkeepsie, where it is used to carry a new 110-kv transmission circuit under the Hudson River.

Early studies showed that an aerial span over the river would have required 4,200 ft between supports. Moreover, to secure adequate clearance for navigation, supporting towers would have to be 450 ft above river level at the point of conductor attachment. Other difficulties in obtaining steel and in doing under-water foundation work, coupled with the risks of an aerial crossing, suggested the desirability of investigating the use of a submarine crossing.

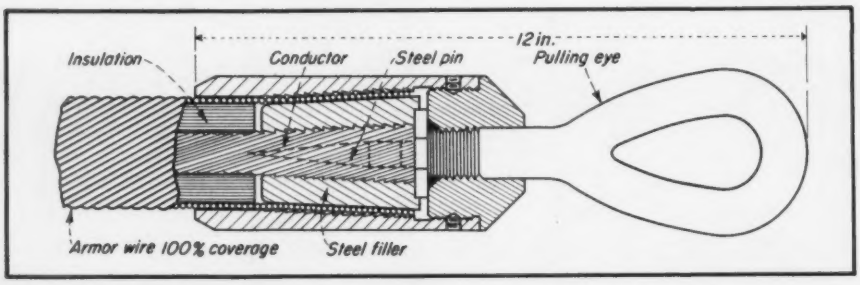
As a result of this investigation an Oilostatic high-oil-pressure pipe system was selected as the most reliable type cable for this particular project. Difference in elevation between cable terminals and the river bottom, as shown in the diagram, made lead-armor oil-filled submarine cables appear less satisfactory and less reliable than the pipe installation. The 15-yr record of reliability of high-oil-pressure pipe-type cable indicated that a high degree of reliability could be expected. Cost estimates showed that this submarine crossing could be installed at less than the equivalent overhead crossing.



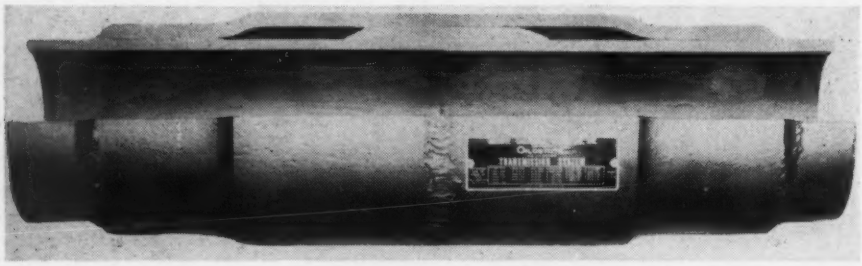
TERMINAL STRUCTURE on east shore of river where Oilostatic submarine cable connects with 110-kv overhead line. Western terminal is seen on far shore above target board at right

The transmission line, of which this cable is an integral part, was designed for a load of 100,000 kva at 110 kv. Spacing and insulation were provided for possible future conversion to 132 kv. The cable crossing, therefore, was designed to meet the same conditions. The cable consists of three single-conductor paper-insulated, 500,000 cir mil cables, each with an outer wrap of hard drawn copper armor to absorb part of the pulling strain. Pipe for the cable was 6⅝ in. O.D. 0.432 in. wall thickness, seamless double random length, factory coated with bitumastic enamel and asbestos felt.

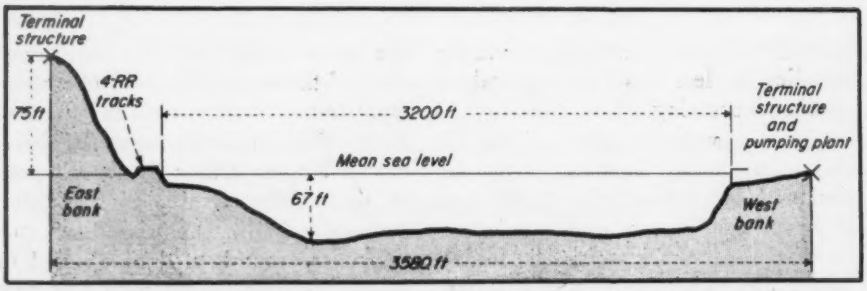
EXTRA BUOYANCY and added protection for the pipe was imparted by wooden lags strapped to the pipe along its complete length. Five 700-ft lengths were made ready



PULLING EYE employed a tapered steel bushing to replace about four in. of cable insulation. The main body of the unit was slid over the end. Velocity gun drove steel pin into end of conductor, compressing copper and steel into solid mass. Eye was screwed into end of body. Tension tends to increase gripping action



DOUBLE SLEEVE provides extra strength at the welds in the pipe. Small inner sleeve covers butted ends of beveled pipes and is welded to them. After testing, two larger split sleeves of larger diameter with swedged ends were placed over inner sleeve and welded as shown in cut-away view above



PROFILE OF CABLE CROSSING shows depth of Hudson River and differences of elevation

Previous experience of the company with the laying of gas mains under the Hudson River indicated the desirability of welding the pipe into long sections on shore. Space was available on the west shore for the pipe to be welded into lengths of 700 ft. Upon the advice of Merritt, Chapman & Scott, who were employed as contractors on the pipe laying, a $\frac{3}{8}$-in. steel cable was laid across the river bed to drag the pipe across the river. Partial buoyancy was given to the pipe, by encasing it in 2 x 4 in. wooden lags strapped along its complete length. This resulted in a negative buoyancy of about 5 lb per ft of length and was sufficient to keep the pipe from being moved by the river currents. It also aided greatly in the ease of pulling. Moreover, the lagging provided excellent protection to the pipe coating against damage during the dragging process.

Special Pipe Joint

To insure adequate strength for the pipe joints, an adaptation of a patented joint previously used by the company on gas main submarine crossings was used. A cut-away view of the pipe joint is shown.

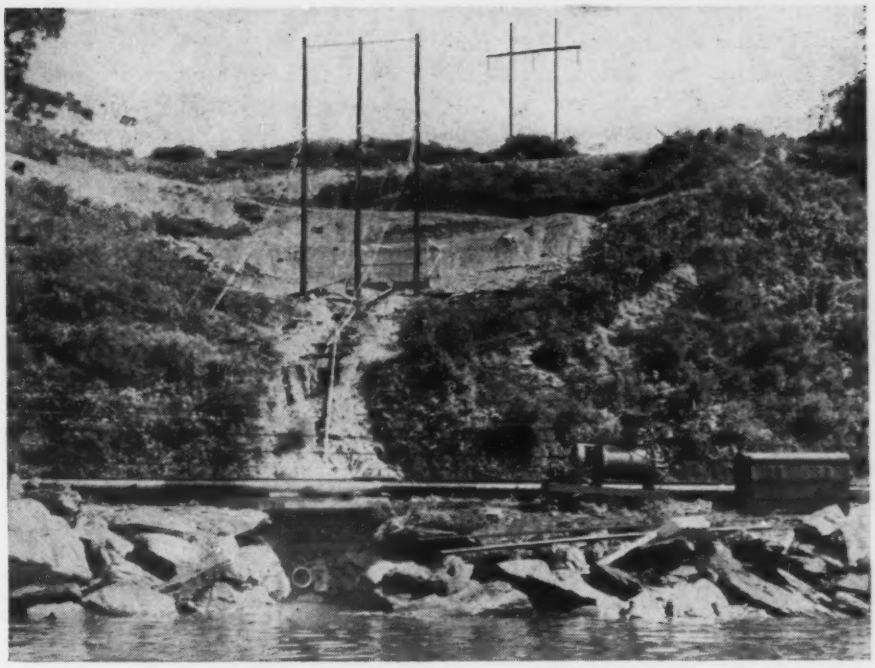
To make the joint, a threadless snug fit coupling was first fitted over the butted ends of the inside beveled pipe ends and this was electrically welded to the pipe with four continuous passes around the pipe. The pipe was rotated during the process so that welding process could be continuous and the welder could be located in the most favorable position for good welding. When 700-ft lengths were welded together, the pipe ends were temporarily plugged, 100-psi air pressure was applied, and a soap solution test was made on each joint to insure absolute tightness. Following this test, two split sleeves of larger diameter, with ends swedged to fit snugly over the diameter, were placed over the inner sleeve, and electrically welded with five continuous passes on each of the three welds in the same manner as previously described. After completion of the weld, the entire joint was again tested by introducing 400-psi nitrogen into the space between the two sets of sleeves, through a $\frac{1}{8}$-in. tapped hole in one of the outer sleeves, and tested for leaks with soap solution. This latter test could be performed rapidly as the

volume between sleeves was small.

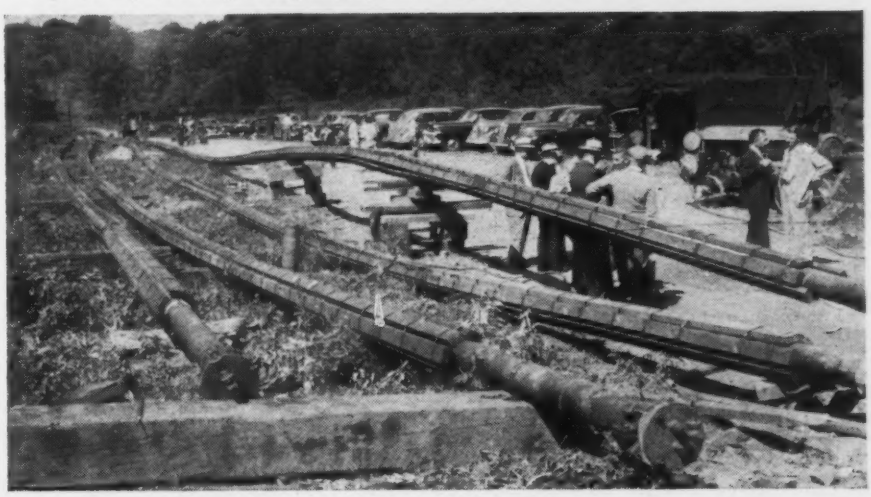
As an additional precaution against the possibility of leaks in the inner sleeve, the joint was valved off from the nitrogen supply and allowed to set for about 15 min. With the small volume of gas under pressure between the two sleeves, even small pinhole leaks could be detected by loss of pressure in this period. Following final pressure tests, the sleeves and any exposed pipe were coated and hand wrapped with the same corrosive protective material used on the pipe. The entire covering was tested electrically with a Holiday detector before being covered with wooden lags.

Before pulling the pipe into position, the shore ends of the river bottom were dredged 600 ft on the east shore and 200 ft on the west shore to a depth of approximately 4 ft for protective reasons. The rest of the river bed was not dredged, as it was comparatively smooth, and of reasonably soft clay into which the pipe will gradually sink to a depth of approximately 2 ft before resting on a harder bottom of clay. The river at this location is of considerable depth as shown in the cross section and there is no reason for shipping to anchor here. There is, therefore, little reason to expect damage from river traffic, and protection was required only from shore movement and ice floes and drifts.

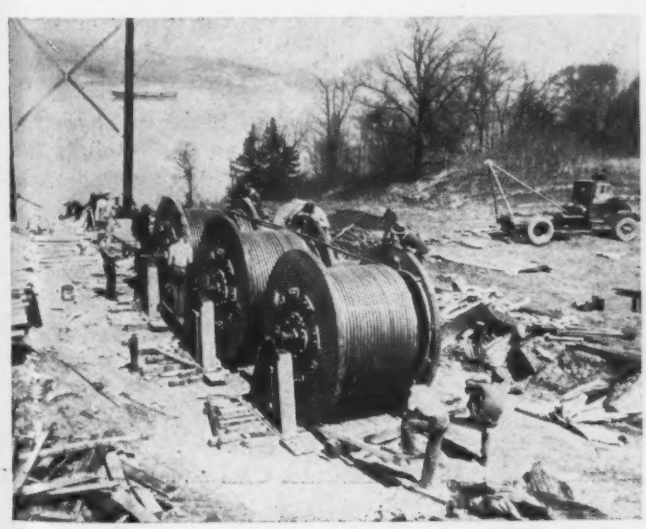
On the east shore, a 4-track rail system of the New York Central Railroad is located directly adjacent to the river's edge, and there was no possibility of terminating the pipe here. Consequently a 12-in. steel pipe,



UNDER 4-TRACK RAILROAD, cable line is carried in a 12-in. pipe sleeve 70-ft long that was pushed hydraulically through riprap ballast. End of sleeve is visible in center



PIPE LENGTHS, each 700-ft long and covered with 2 x 4-in. lagging over bitumastic compound, laid up on west bank. Caps over pipe ends allow pressure testing of welds



REEL SET UP was located on bluff of east bank to facilitate pulling. Three 3,675-ft continuous lengths were pulled simultaneously

PULLING SET UP on west bank was controlled by radio communications between shores of the Hudson River

70 ft in length, was jacked hydraulically under the railroad bed previous to the submarine operation. Considerable difficulty was encountered in this operation, as the track nearest the shore was laid over riprap boulders, some of which were displaced in the operation. With the helpful cooperation of New York Central Railroad forces, it was eventually possible to push the pipe through to the shore line. The pipe cable was inserted into this sleeve.

Location of railroad tracks directly on the east shore made it impossible to perform pipe pulling operations with a winch on shore. This operation was therefore conducted from a winch on a lighter anchored off shore. Aided by rollers, the 700-ft lengths of pipe were pulled into the river by the cable line. As each trailing end reached the river bank it was welded to the leading end of its successor by the methods described.

When the entire pipe had been successfully pulled, a diver was sent down to cover the route, and to jet down any high spots which might keep the pipe from lying evenly on the river bed. The actual length of 6-in. pipe installed between terminals was 3,630 ft. The river is 3,200 ft wide between shore lines.

When ready to install the cables, the three reels, on which the three single conductor cables were shipped, were set up on the high ground above the eastern end of the pipe, so that the pull would start downhill. Pulling was done by a power winch tractor on the west shore. Pulling eyes, specially designed by the Okonite engineers for this job, were applied to the cable ends in the field by means of a velocity gun, so that pulling armor and conductors were mutually gripped, as shown in the diagram.

Cable was shipped sheathed in lead, which was stripped as the cable was fed into the pipe. All three cables were pulled the entire distance without any splice, and the complete operation, including temporary sealing of the ends, was completed in a single day. Actual pulling tensions, on which readings were taken at frequent intervals, were less than originally anticipated. Pulling speeds were limited by the speed at which lead sheathing could be stripped, and varied from 15 to 22.5 fpm. The final cut length of cable between terminals was 3,675 ft, and is reputedly the longest distance three high-tension cables have been pulled in pipe.

Terminals at each end have 161-kv porcelain potheads. A single pumping unit, with automatic duplicate pumping equipment, for maintaining oil pressure at 200 psi, is located at the west terminal.

Means of Protection

The pipe has been provided with cathodic protection and is maintained at approximately one volt negative to ground. Lightning arresters are mounted adjacent to the terminals at both ends of the pipe, and as an additional precaution, expulsion gap arresters are mounted on the first transmission structure away from the terminals. The arrester impulse levels are well below the impulse strength of the cables and should adequately protect the cable under all conditions.

Acknowledgment is made for the valuable services of Messrs. C. E. Bennett, Paul White and Guy Everest of the Okonite-Callender Cable Co in the layout and construction of this crossing.

VITAL STATISTICS
SUBMARINE PIPE CABLE INSTALLATION

PIPE	
Installed length	3,629 ft
Diameter (O.D.)	6.625 in.
Wall thickness	0.432 in.
Cross section area (I.D.)	26.067 sq in.
Weight per foot	28.57 lb
Installed weight	103,700 lb
Pipe joints	91
Welds per joint	5
Sleeve under railroad	70 ft — 12 in. O.D. pipe
CABLE	
Installed length per phase	3,674 ft
Total installed length	11,022 ft
Diameter (O.D.)	2.182 in.
Cross section area	3.75 sq in. 500,000 cir mil, 61 strands of diam = 0.814 in. 3 metallized paper tapes 0.560 in. wall, paper insulation 1 metallized paper tape 1 copper and cotton tape
Armor wire	No. 10 H.D. copper 54 strands
Lead sheath (removed)	0.0625 in. thick 2.17 lb per ft
Weight per foot, cable	5.38 lb
Installed weight per phase	19,766 lb
Total installed weight	59,298 lb
Weight of lead sheath (removed)	25,025 lb
PULLING OPERATION	
Natural head on pipe	135 ft
Width of river at crossing point	3,175 ft
Maximum depth of river at crossing point	67 ft
Pulling line	1 in. plow steel cable
Pulling time	Gross = 8.5 hr Net = approx. 4 hr
Pulling speed	Max. = 22.5 fpm Min. = 6.0 fpm Avg. = 16.0 fpm
Pulling tension	Max. = 10,000 lb Avg. for 1st half of pull = 5,000 lbs Avg. for 2nd half of pull = 8,000 lbs
INSULATING OIL	
Cross section area of pipe not occupied by cables	14.75 sq in. = 56.6%
Amount in system	3,700 gal
Time required to fill pipe	3 hr
TERMINAL BUSHINGS	
Weight, each	1,500 lb
K-v rating	161 kv
Time required to install each	4 hr
Difference in elevation between east-west bushings	58 ft

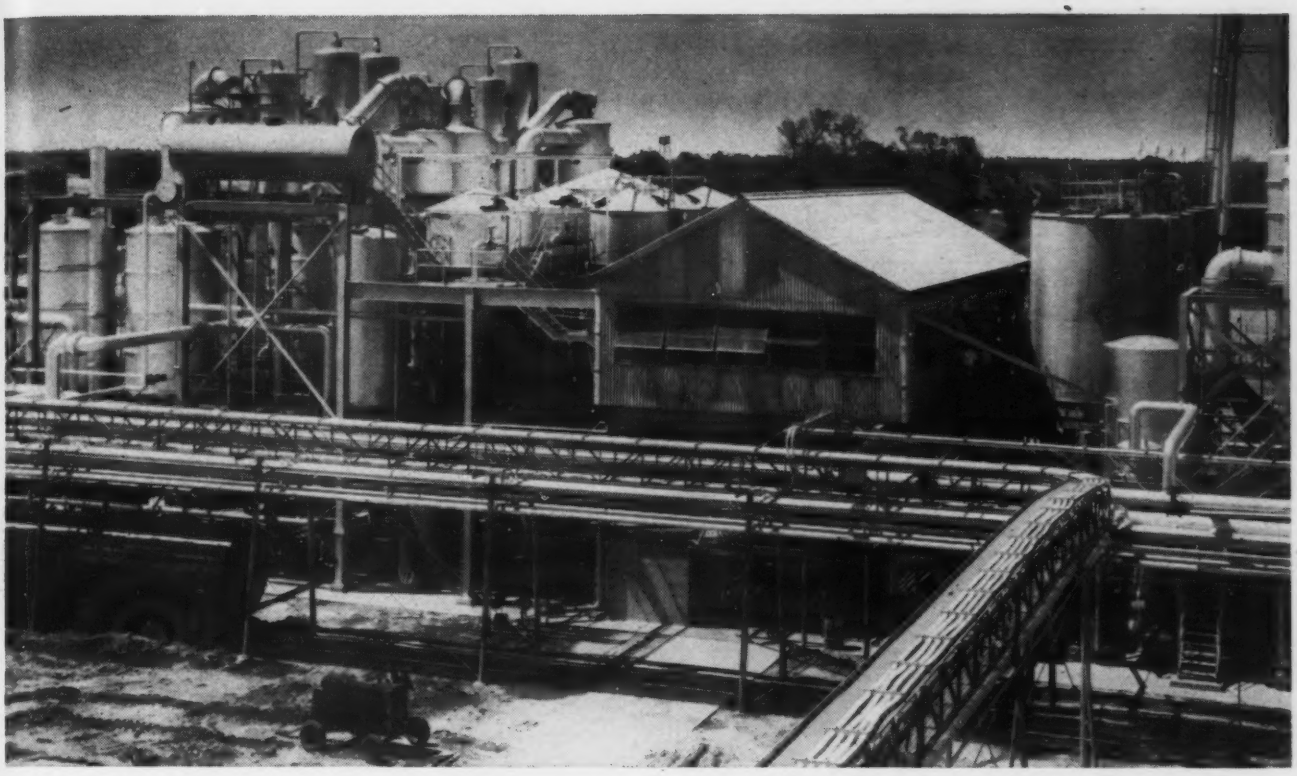


FIG 1—OVERHEAD CABLES for high-voltage feeders avoid any difficulty with corrosion or underground cable. A common structure of the modified H-frame type, originally intended for supporting process piping, now carries power cables as well

Ultra-Reliable Distribution System Serves New Chemical Plant

Uninterrupted distribution of electrical energy on a day-in day-out 24 hr schedule is essential in electrolytic production of chlorine and caustic soda . . . . Reliability, safety, and safeguards from corrosion are among the factors that influenced design of the electrical distribution system in this new industrial plant

J. R. HORACEK
Utilities Engineer
Diamond Alkali Co
Pasadena, Texas

EXTREME OPERATING reliability for the distribution of electric power to electrolytic cells and other processing units is integrated into Diamond Alkali's new plant near Houston, Texas. In addition, the electrical system is designed for safety, simplicity of circuit arrangement, and ease of maintenance. The system uses ventilated tunnels for primary cables; a solid-ground network; overhead structures for high-voltage distribution cables, as shown in Fig 1; centralized control room; color coded control wiring; and 3,500 ft of aerial cable.

Requiring about 30,000 kw daily the new plant produces 220 tons of chlorine and 240 tons of caustic soda by electrolytic cells using raw salt brine. Because of special process requirements, the plant generates and distributes its own power. About 80% of the plant load consists of four 650-v 10,000-amp mercury arc rectifiers. The rest of the load consists of motors for driving various chlorine-and-caustic-processing units and for lighting.

Motors range in size from 300 hp down to fractionals. All are across-the-line start, and, except for those motors that were shipped on equipment transferred from other Diamond plants, they are totally-enclosed and fan-cooled. To eliminate chronic centrifugal starting switch troubles resulting from use in a possibly corrosive

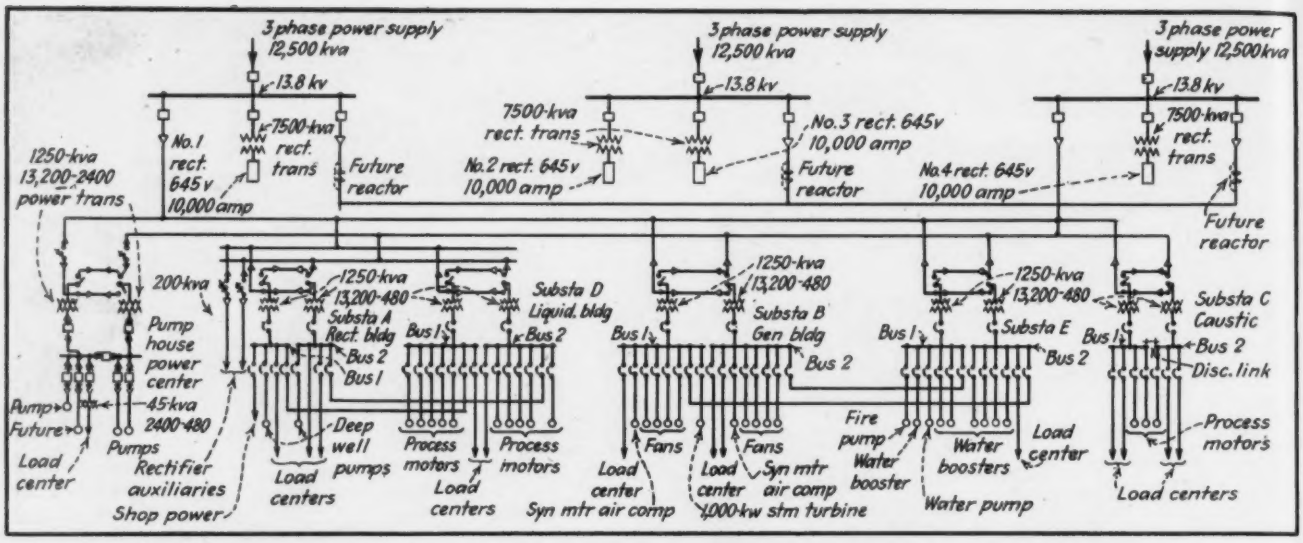


FIG 2—RELIABLE DISTRIBUTION is obtained by the flexibility of interconnections for both primary and secondary circuits

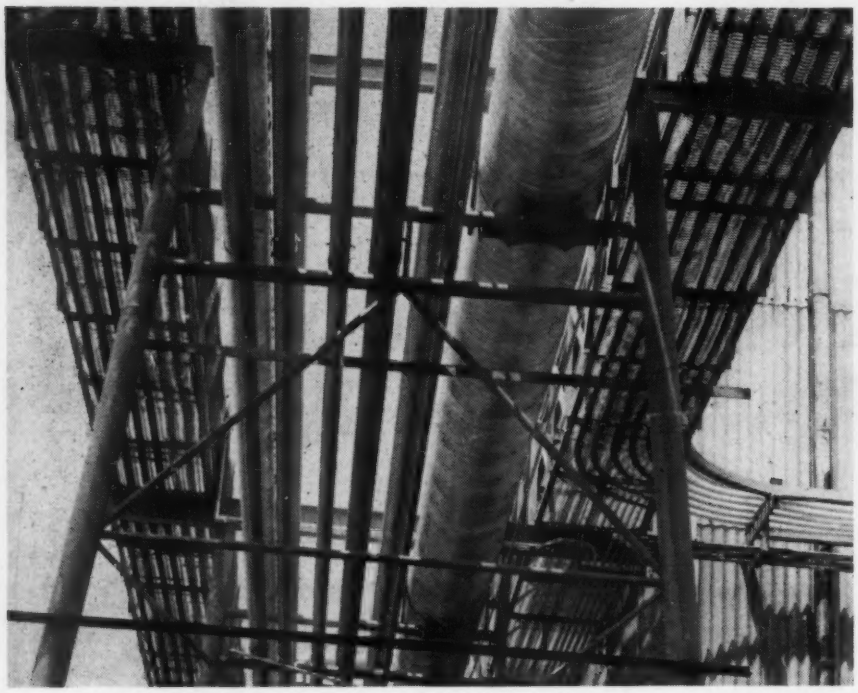


FIG 3—EXPANDED METAL GRATING supports the armored cable, which is held in place by wooden blocks

atmosphere, the fractional-hp motors are mostly 440 v, three phase. This helped unify starting gear and control. Three-phase, 4-wire 120/208-v service is used for the lighting system.

Three sections of switchgear, each served by a main generator, are located outdoors immediately south of the generating plant. Switchgear is outdoor metal-clad type with draw-out oil circuit breakers. Automatic protection prevents drawing out of a breaker without its being de-energized Each unit is rated at 15 kv, 600 amp, and is installed over a tunnel that allows cable entrance into the gear from below. The switchgear uses bus differential relaying, which will open all of the breakers connected to the bus in event of short-circuiting within the switchgear.

Primary Cables

All high-voltage cables throughout the plant, including generator leads, are insulated with varnished cambric and covered with a vinyl hose jacket. The cable is protected with interlocking bronze armor. The generator leads drop into a cable tunnel connecting with the tunnels beneath the switchgear units.

These leads, which are single conductor cable, are racked on the tunnel walls. Transite baffles installed over each set of leads protect them against damage in the event of short-circuits occurring in adjacent sets. To prevent possible absorption of heat by the cable from iron supports, wood and aluminum are used in the support construction. A blower at one end cools the tunnel.

Ground Network

The generator neutral is grounded through a resistor that limits the ground fault currents to 500 amp. All high-voltage cables are protected by high-speed ground relays, which selectively isolate a faulted cable.

A ground network has been provided throughout the plant. Motor frames, all pieces of switchgear, cable supports, building steel and the like are connected by metal-to-metal contact to the same ground as the generator neutral resistor. This ground network was considered essential to: (1) Minimize the possibility of shock hazards to operating personnel; (2) prevent the electrolysis of cables due to stray currents; and (3) provide the most dependable type of protective relaying.

The three sections of high-voltage switchgear are connected together through a synchronous-tie bus. The tie bus is connected to the main buses through oil circuit breakers mounted in each bus section. The tie bus is protected by differential relaying that

overlaps the differential relaying on the main buses. Composed of the same single conductor armored cable used for the generator leads, the synchronous bus is located in the cross tunnel below the switchgear.

Overhead Distribution Cables

Much thought was given to the type of cable to be used for the high-voltage feeders as well as to their location underground or overhead. With many chemical plants, especially those having electrolytic operations, prevailing soil conditions are often unfavorable to the use of underground lead cable. Corrosion due to chemically saturated soil and failures caused by electrolytic action of d-c leakage are frequent. An equipment outage resulting from a fault in an underground cable is likely to be of considerable duration; also, repair of the cable will be difficult. Since the process piping was to be carried on an overhead structure, it was no problem to use the same structural network for carrying the power cables.

The pipes are carried on modified H-frames, the tops of which are crossed with supporting beams. Box trusses are suspended from the overhanging sections of each beam and then extended from frame to frame. As shown in Fig 3, expanded metal grating is used on both top and bottom of the box trusses. The armored cable is laid on the grating and held in place with wood blocks and J-bolts.

Both No. 1 and No. 3 high-voltage switchgear sections have a breaker for feeding the first and fourth rectifiers, respectively, as shown in the schematic circuit; No. 2 switchgear section has breakers that feed rectifiers No. 2 and 3. These rectifier cables drop into the cable tunnel under the switchgear. They leave through the tunnel wall and rise to the trusses on the pipe structure between the powerhouse and the switchgear.

In the vertical position the cables are supported by wooden clamps bolted to structural members on the pipe rack. The four rectifier cables run side by side on the top level of the truss for a distance of about 500 ft, transfer to the wall of the Rectifier Building, then branch off to their respective rectifier transformers.

Since the transformers are of the bushing type, the cables terminate in potheads and the connection to the transformer is made with bare copper tubing. Connections from potheads to transformers and from transformers to the building are made in line with conventional outdoor substation design.

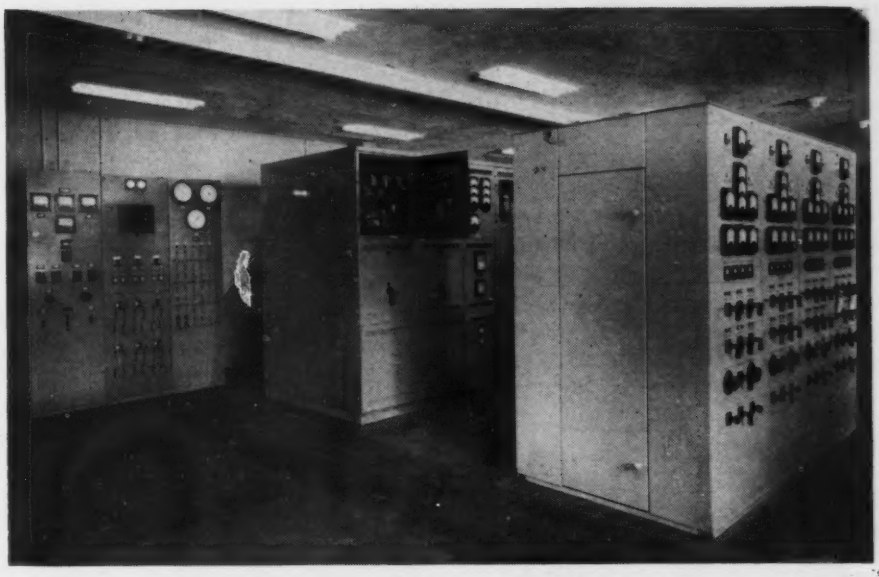


FIG 4—CENTRALIZED CONTROL ROOM has tunnel-type control boards with switches and instruments on front; relays and meters are mounted on the rear

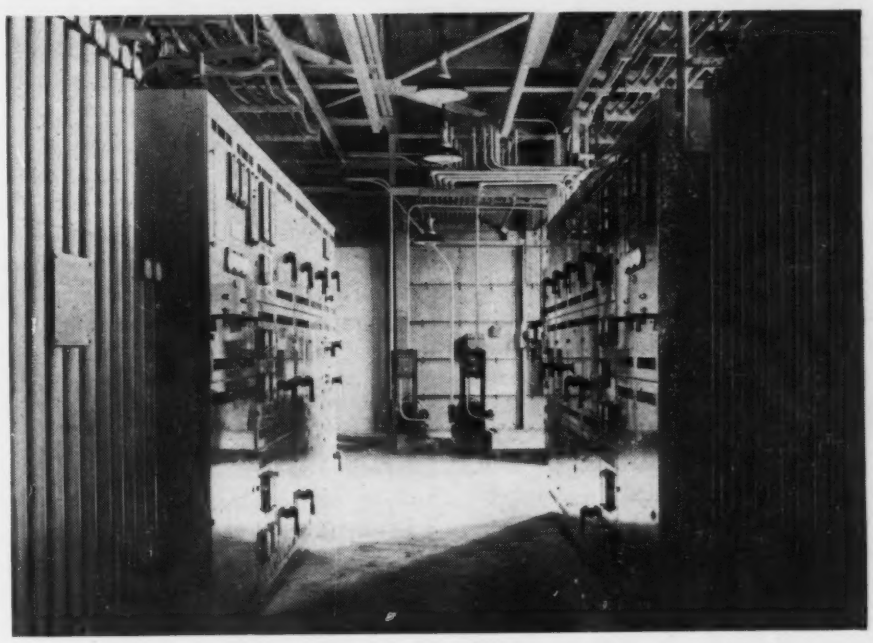


FIG 5—MAIN SUBSTATION located at Chlorine and Liquefaction Building is one of five installed at plant load centers

Centralized Control Room

Since most of the load on the main generators is taken by the rectifiers to supply power for the cells, any change in operation of the rectifiers would affect the generators. Conversely, any change in operation of the generators would affect the rectifiers. If the controls of the generators and the rectifiers were separated, close departmental communication would be necessary and in times of emergency confusion might result.

To avoid any such possibility, generator, feeder and rectifier controls are centralized in one control room as shown in Fig 4. With boiler operators available at the power house to check turbo-generator operations, the combined control room is located adjacent to the rectifier room where

other engineering personnel are always on hand to check the rectifier operation.

In the control room, which immediately adjoins the second floor rectifier room, rectifier and generator control boards face each other. Thus the dispatcher operates between them. The control boards are of the tunnel type, with switches and instruments mounted on the front and relays and meters mounted on the rear.

Color-Coded Control Wiring

All control wiring is multiple conductor, color-coded, vinyl-insulated cable. Rectifier control cables drop from the inside of the board through floor slots into transite cable trays at ceiling level of the first floor. They then are tiered along the south wall for the entire 300-ft length of the Rectifier Building.

At each rectifier the cables for that unit and its auxiliaries are transferred to smaller cross trays, which take each cable to the equipment it controls. Control of all breakers and adjustment of voltage and current plus instrumentation and metering are handled from this control board.

Control cabling for generators and feeders is done in much the same manner as for the rectifiers, except that the transite cable trays feed the cables into an underground duct bank running to the cable tunnel beneath the high-voltage switchgear. This duct bank is composed of 99 2-in. fiber conduits encased in concrete. It is 500-ft long and one manhole is employed in making a 90-deg change in direction. At the switchgear end, the control cable is again run in trays to the various equipment on the generator and breakers.

Secondary Distribution

Since the various plant departments are interconnected processwise, secondary power is available to avoid impairing all operations when a power failure interrupts one. The general scheme is to transmit power at 13,800 v to different plant load centers where it is reduced to 460 v. Substations are located at the water intake station along the Houston Ship Channel, the main control room, the powerhouse, the caustic evaporation area, the chlorine liquefaction installation, and at the water booster pumping station. An interior view of a typical substation is shown in Fig 5.

Two feeders, controlled by oil circuit breakers in two of the four buses of the high-voltage switchgear, supply power to the substations. An armored cable from each breaker drops from the switchgear and runs to two 13,800-v junction boxes located between the powerhouse and the gear. Branch feeders from these junction boxes supply power directly to four substations and also to two junction boxes at the control room. These are set up for feeders to future stations as well as to supply power to the substations in the control room and the liquefaction area.

Individual substations have two separate circuits, each served by a 1250-kva, 13,200—480-v, non-inflammable, liquid-cooled transformer, and high-capacity 480-v, air circuit breaker switchgear. Selector type disconnects are mounted on the transformer primaries to prevent an outage on six of the transformers should a short circuit develop on any feeder cable. These disconnects allow the transformer to be energized from either feeder. Power from the transformer feeds through secondary breakers to the metal-enclosed switchgear. Substation feeders are carried on the pipe support trusses and building wall in the same manner as the rectifier feeders.

Grounded Messenger Cable

Interlocked armored cable with a built-in messenger is used for the 3,500-ft run to the intake station. This cable is hung from 30-ft, Class 3, creosoted poles spaced at 150-ft intervals. The messenger is grounded at each pole and to the intake piling at the channel. The plant end of the messenger is grounded to the plant ground network and to a 60-ft metal pile driven at the powerhouse.

For service continuity it was originally planned to interconnect all 440-v substation buses through suitable breakers. But this would require costly breakers with an excessively high interrupting capacity.

To lower the required interrupting capacity without greatly affecting the continuous service consideration, it was then decided to interconnect only the buses of the two circuits of each station. Because of the low tie reactance, interrupting capacity needed was still too large to meet the requirements. The final design interconnected buses in pairs, with the buses placed in different substations. This arrangement increased the tie reactance and brought the required interrupting capacity to the desired level without sacrificing the desired high degree of service continuity.

With this system each bus in the Liquefaction Building substation is connected through breakers to a bus in the control room substation. Similarly, the power plant is connected to the booster station on the 440-v side. Reverse current relays are provided on the transformer secondary breakers.

Fault Clearing

With the relays set correctly, and the selector switches in the proper position, a fault on either feeder is cleared by overload operation on the high-voltage breaker and reverse current operation on the transformer secondary breakers. This clears the faulted feeder and requires no deenergization of a substation bus.

The transformer secondary breakers are rated at 1200 amp (75,000-amp IC) and the 440-v tie breakers at 600 amp (50,000-amp IC). Air circuit breakers of the same interrupting capacity as the tie breakers are used to start motors of 60-hp and above. Smaller motors are started by combination circuit breaker starters mounted in control centers supplied by breakers in the high-capacity gear. All motors are across-the-line start, including the 2300-v, 300-hp intake station motors. The 2300-v gear is of the air break type. The system is designed to hold the voltage drop on the starting of any motor to less than 5%.

Lighting transformer banks are located near load concentrations and range from 30 to 225 kva. The banks are served from either the high-capacity gear or the control centers, depending on lighting transformer size and service. These transformers are connected delta on the 460-v side and grounded wye on the 208/120-v side.

Thus by careful design, electrical facilities at the new Houston plant provide extreme dependability, safety, simplified maintenance and freedom from many of the problems associated with underground distribution in chemical plants.

CONFERENCE of supervisors led by J. E. Mueller, manager of commercial and residential sales, hopes to increase employee job enthusiasm

West Penn's Bosses Study Today's Supervisory Problems

System-wide supervisory conference program, designed to help management personnel at all levels meet today's new problems . . . Program conducted by "student" committees which select own conference topics . . . 90% of supervisory personnel participating

JOHN K. WALTER
Training Supervisor

H. S. METCALFE
Director of Public Relations
West Penn Power Co
Pittsburgh, Pa.

THIS FALL 470 West Penn men and women, 90% of the company's management personnel, went back to school. They are participating in the company's third series of monthly conferences on supervisory subjects. This Supervisory Conference Program, as it is called, is West Penn's answer to the basic training needs of supervisors of all levels as they face today's new problems. It is a long-haul investment that the company is convinced will produce better understanding, straighter thinking, increased participation in the broader tasks of management, and more enthusiasm for the job. In short, better supervision!

Like other electric utilities, West Penn has been growing so fast that too little attention has been given to the growing distance between the worker and the front office, or to the bigger demands of the supervisor's job. While the company has been proud of its existing supervisory methods, it has become increasingly clear that these methods have to be scrutinized and revised in some cases to meet the broader needs of today's supervisor in a large company.

The conference program is an ideal way to approach the problem of improving supervisory methods. It gives the supervisor a procedure and an occasion to analyze his own methods and to compare them with those used by others. It lets him bring his

LOCAL CONFERENCE GROUP led by district manager Don Faust, discusses "Employee Recreation Programs," including such topics as the need for and objectives of these activities

ideas and experience to bear on specific management problems. And the experience he gets in the conference participation can itself be a valuable contribution to supervisory morale.

The specific objective of West Penn's conference program is to improve supervision by:

1. Advancing the understanding of supervisory responsibilities, company policies and organization; and increasing facility in handling day-to-day worker relations.

2. Giving supervisors of various interests an opportunity to become better acquainted and to acquire a sympathetic understanding of the other fellow's problems and viewpoint.

3. Improving the flow of information up and down the line between top management and other supervisors.

4. Promoting the conference method as a management tool in reaching group solutions to problems.

Program Developed Slowly

The supervisory conference program has been a gradual development. It started in the winter of 1946 with a series of seven 2-hour conferences among 100 supervisors in two of the company's six field areas. In these two pioneer areas top management not only offered its encouragement but backed up the program by giving careful consideration to recommendations growing out of conference discussions.

Since the program started, additional groups of supervisors have been included, but only as they *and* their bosses became sold on the benefits of participation. Groups of supervisors have been free to decide whether or not to participate; certain groups have elected not to participate.

Result of this development today is a dynamic conference program involving 470 supervisors who have themselves voted to participate; who are proceeding with the development and administration of their own programs; and who earn and get the active participation and support of the company's management all the way to the top.

Committees Run the Program

Responsibility for planning and administration of the program has been at the local level. Each of the seven geographical areas participating has its own local steering committee made up of selected conferees representing various interests. Each area committee is charged with seeing that the program remains healthy and continues to meet local needs. Area committees also screen, follow-up, and report back to conferees on recommendations resulting from local conference discussions.

A system coordinating committee, which includes chairman of each local steering committee and members of the training staff, is responsible for the vitality of the program as a whole, including the editing, follow-up, and reporting on conference recommendations of general interest. Each of the 28 conference groups includes from 15 to 20 conferees of various supervisory levels and interests. All levels of management participate. Staff as well as line supervisors are included. The variety of outlook and experience thus included in each group has been found to be a stimulating influence on discussion and conference productivity.

Conferees Select Topics

The present program comprises a series of eight 2-hour conferences, at monthly intervals, starting in October and running through May.

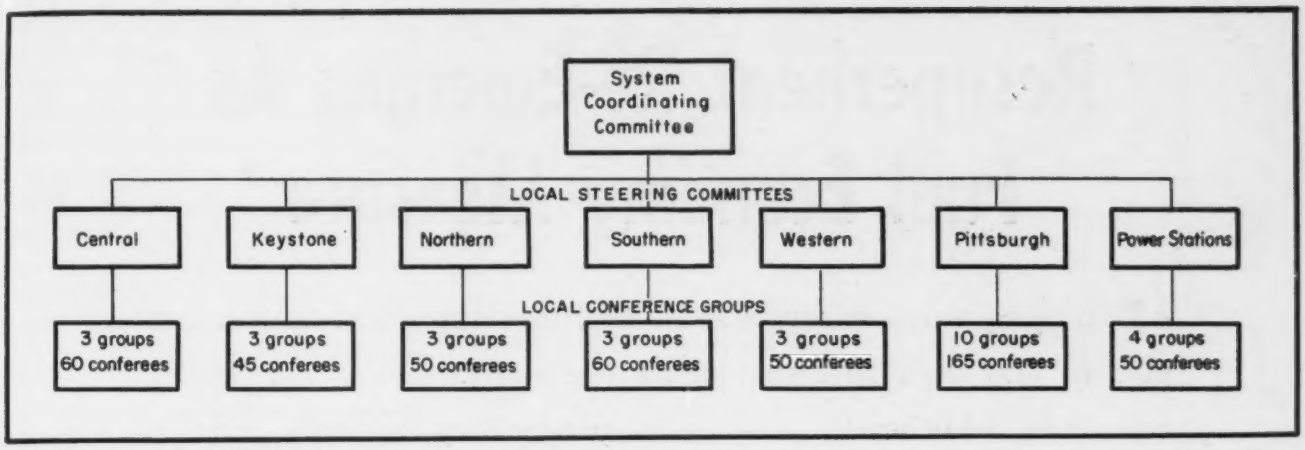
Conference topics are selected by poll of conferees. For example, four topics listed below have been scheduled for system-wide discussion during four of the eight conference rounds.

1. Line and staff supervision
2. Basic responsibilities and limitations of the supervisor
3. Delegating responsibility
4. Selling your ideas

Four of the local steering committees have undertaken to develop discussion outlines, prepare background

Typical Conference Topics

1. Basic Responsibility of a Supervisor
2. Introducing the New Employee to his Job
3. Keeping Employees Informed
4. Interesting the Employee In His Job
5. How to Handle Grievances
6. The Supervisor and the Safety Program
7. Relative Responsibilities of Line and Staff Supervisors
8. Giving Orders or Directions
9. Putting the Right Worker on the Job
10. Rewarding Employees for Good Work



COMMITTEE ORGANIZATION for planning and administration of Supervisory Conference Program. Local steering committees of selected conferees fit program to local needs. System Coordinating Committee includes chairman of local committees

material, select visual aids and conduct pilot conferences on these topics.

Topics for the four intervening meetings deal with current supervisory problems of local interest and are selected and developed entirely at the local level.

Conference Leader Hand Picked

Careful selection and training of conference leaders is of vital importance to the success of the program. When the program started, the first 24 conference leaders were given a 30-hr training course under a representative of the University of Pittsburgh. The training staff has since developed a comprehensive instructor's guide for training conference leaders. This guide has helped coordinate the team efforts of seven experienced conference leaders in training additional leaders.

This year, before the conference season began, a day-long refresher session was staged for previously trained leaders. They brushed up on conference techniques and were given new tools to use during their winter conference assignments.

Guides and check lists given to the conference leader help him in preparing, leading, and reporting the conference and evaluating his own performance. Use has been made of material in the following texts: *How to Train Supervisors,* by R. O. Beckman; *Conference Leadership,* by A. M. Cooper; and a reprint of an article titled, *A Guide to Successful Conference Leadership,* contained in the March and July, 1948, issues of the magazine *Personnel.*

Conference Procedure Is Simple

Most of the conferences follow a logical and simple procedure:

1. The conference group agrees on the specific conference *Objective.*
2. Group agrees on *Discussion Steps* to follow in reaching the *Objective.*
3. Facts, experiences, and opinions of the group which bear on the subject are gathered. A charting procedure is often followed.
4. These data are analyzed and evaluated through discussion.
5. A *Plan of Action* is developed.
6. A procedure is set up to *Follow-Up on the Plan of Action.*
7. Minutes of each conference are prepared and distributed promptly to conferees.

Program Worth Its Cost

This conference program costs money; primarily supervisory time and transportation expense. But West Penn regards the time and money a good investment.

Acceptance of the program by the conferees is West Penn's primary basis of evaluation. Reaction of conferees to last season's program is convincing evidence of acceptance. Of those responding to an unsigned questionaire 69% felt the program was "well worth the time and effort required"; 28% felt that it was "of moderate worth," and only 3% felt that it was "of little value." Response to certain more specific questions are listed.

Survey Shows that "Students" Like the Course

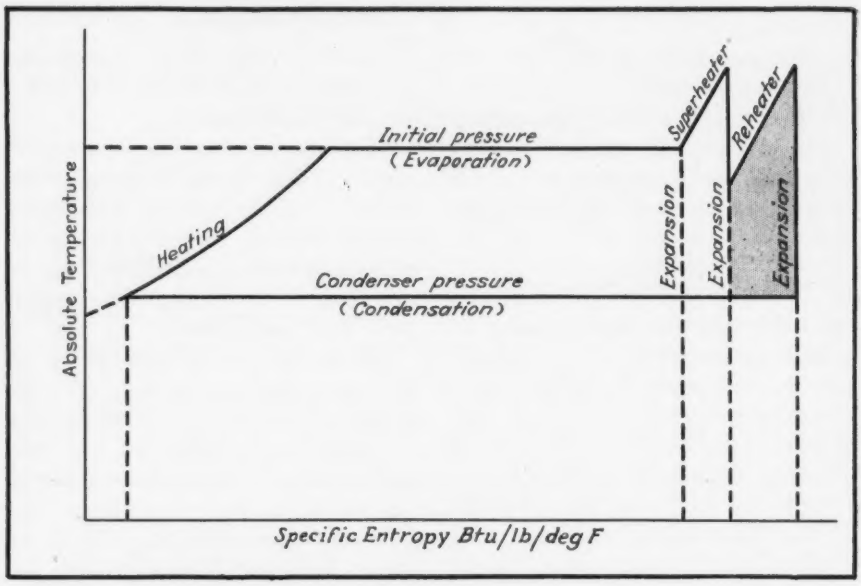
	Percentage of Total Returns	
	Yes	No
1. Do you have a better understanding of other fellows' problems and methods?	82	18
2. Do you have a better understanding of your responsibilities as a supervisor?	85	15
3. Has a better flow of ideas between top management and supervisor resulted?	78	22
4. Have the conferences pointed out some of your deficiencies?	86	14
5. Have you made any changes in your supervision methods?	68	32
6. Do you like the conference method?	92	8
7. Do you want a program for next season?	84	16

Resuperheat Re-Emerges As Fuel Economy Measure

ASME Symposium excerpts show that new superheat temperature plateau and high fuel cost make cycle attractive . . . Boilers cost little additional . . . Supplementary controls required

THE PRESENT renewed interest in and the use of the resuperheat cycle parallels in many respects the conditions that led to its application twenty-five years ago.

In the middle 1920's and early 1930's, a number of installations of steam power generating equipment using the resuperheat cycle were installed for central station service. This was a period when initial temperatures had reached the 750 F level. Higher thermal efficiency stations were built using the resuperheating cycle. Roughly, a thermal gain of 5 to 6% was obtained by using the resuperheating cycle. This gain was not equalled by non-reheat cycles until progress permitted initial temperatures of the order of 900 F. Thus the efficiency of these early resuperheat installations equalled the efficiency of non-reheat installations made years later at higher temperature levels.



TEMPERATURE ENTROPY diagram of a reheat cycle

Steam Turbines For Resuperheat Cycle

E. E. PARKER
General Electric Co

FOR STEAM electric stations, the use of the resuperheating cycle permits the construction of new generating units with station heat rates 4 to 5% lower than non-reheat installations at the same temperature and pressure levels. The return from this improvement in efficiency is appreciable and merits the careful consideration of this cycle for all new installations, particularly with present-day fuel costs.

A turbine for the resuperheat cycle requires controls customarily used on a non-reheat turbine, plus an intercept valve together with its control. This intercept valve is located close to the turbine in the line returning the steam from the reheater. The sole purpose of this intercept valve is to prevent the turbine speed from reaching 110% and thus tripping the emergency governor when a sudden loss of all or almost all of the electrical load occurs. Without the intercept valve, the turbine speed upon loss of electrical load would rise and trip the emergency stop valve, because steam stored in the reheater and associated piping could still flow through the low pressure section of the turbine, even though the main steam valves were closed.

However, full capacity safety valves must be installed between the exhaust of the high pressure turbine and the intercept valve. These valves, if located on the high temperature side of the reheater, are normally set to start relieving at approximately 10% above the maximum pressure at the intercept valve.

Protection to prevent overheating of the exhaust end of the turbine depends upon the boiler characteristics and the operating cycle. For short periods of operation at light or no load, it is probable that protection will be unnecessary. For prolonged periods of operation at light or no load, provision for protection should be made if the characteristics of the boiler include a temperature rise of any magnitude in the steam passing through the reheater. At light loads, after steady conditions have been reached, it is reasonable to assume that the exhaust of a resuperheat turbine will operate hotter than a similar non-reheat turbine by the number of degrees temperature rise of the steam passing through the reheater. This assumption is valid provided vacuum and temperature conditions are such that the exhaust of the non-reheat unit is saturated or superheated.

In considering a resuperheat instal-

lation, the question arises concerning the starting and permissible rate of load change as compared with a non-reheat unit. Considering only the turbine, the time to start and bring a resuperheat turbine to speed should not differ from that for a non-reheat turbine of comparable size and design. Similarily, if desuperheating of reheated steam at light loads is required in the turbine cross-over and if control of reheat temperature is as accurate as control of initial temperature, the maximum rate of load change is the same for a resuperheat as for a similar non-reheat turbine.

Typical Maximum Load Steam Requirements

Nominal Turbine Rating-kw	60,000	80,000	125,000
Steam Flow-lb per hr	575,000	670,000	930,000
Pressure of Steam at Superheater Outlet-psi	1,500	1,500	2,080
Temperature of Steam at Superheated Outlet-F	1,000	1,000	1,050
Pounds of Steam to Reheater-lb per hr	502,000	606,000	840,000
Pressure of Steam at Reheater Inlet-psi	417	410	420
Pressure of Steam at Reheater Outlet-psi	392	385	390
Temperature of Steam at Reheater Outlet-F	1,000	1,000	1,000
Temperature of Feedwater to Economizer-F	492	435	441

Reheat Turbine Installations

C. A. ROBERTSON
Allis-Chalmers Mfg Co

OPERATING RECORDS of regenerative reheat steam turbines have included base load and varying load operation, together with frequent start-up and shut-down performance. Protective equipment in the reheat line has functioned reliably and subsequent modifications relate more or less to details of design.

An 80,000-kw unit, supplied from a single boiler with a resuperheating section, has set the highest standard of performance in the industry. Subsequent 80,000-kw reheat units in this section are in operation, being installed or under construction.

The design of reheat turbines was based on the consideration that division of pressure between the exhaust of the high and the inlet to the low pressure elements would be approximately 20 psia, or nearly atmospheric pressure. The reheat stage was to be located in the high pressure cylinder.

Construction of the high pressure cylinder, utilizing a diaphragm to separate the high and low temperature reheat steam, requires large extraction belts or passages and results in the location of a high temperature steam chamber adjacent to a low temperature steam chamber. However, experience with this construction over a period of years has indicated the reliability of its design.

The type of construction having the reheat belt in the center of the high pressure cylinder has several advantages: (a) It maintains the conventional straight condensing form of cylinder design characterized by unidirectional flow, with a small diameter in the high pressure-high temperature region which gradually increases toward the low pressure end of the turbine; (b) the leakage losses through the diaphragm are relatively low because the pressure drop across the diaphragm is small, amounting to the pressure loss of the reheater and connecting pipe and valves; and (c) with approximately atmospheric pressure at either end of the casing, the shaft packing problem is simple.

Design of Controls

With reheat units, however, the large volume of steam stored in the reheat piping and steam space of the reheater has an enormous potential energy which is not controlled by the main inlet valves. Therefore, it is necessary to provide some form of reheat protective equipment, such as intercepting valves and unloading valves, in the reheat lines; for these steam turbines these valves are under control of the speed governor.

Some designs protect the reheater, upon loss of load during accidental trip-out of the unit, by means of a manually operated reheater by-pass valve and often an emergency pressure reducing valve, which may be set to open when steam to the high pressure turbine is cut off by either the throttle or governing inlet valves.

Fuel feed must be stopped very promptly upon loss of load. However, there need be no concern of superheater or reheater tubes overheating immediately. These relatively heavy tubes have entirely adequate heat capacity for the few seconds elapsing between the shutting of turbine valves and the stopping of fuel feed.

Flexibility of the reheat units with reference to frequent starting and shutting down is fully suitable for modern central station service.

W. H. ROWAND
A. E. RAYNOR
And F. X. GILG
The Babcock & Wilcox Co

A GREATER PORTION of the heat added to the steam in the reheat cycle is converted to useful energy than would be possible in a normal steam cycle without reheat. Also, the moisture content of the steam in the low-pressure stages of the turbine is reduced so that destructive erosion of the turbine blades is minimized.

Reheaters are actually superheaters and are generally installed as convection surface in a boiler setting. In the early installations, reheaters were installed above or behind the boilers.

A more recent application of reheaters is a pulverized coal fired, slag tap unit in Twin Branch Station,* designed to generate 550,000 lb of steam per hr at 2300 psi and 940 F primary conditions, with partly expanded steam reheated at 400 psi to 900 F.

This unit has been operating successfully for more than seven years. It operates at maximum load with yearly outages. Its availability has been in the order of 95%. The station heat rate of the unit served by this reheat steam generating unit is about 10,000 Btu per net kw.

Experience gained on this unit has permitted a simplification of the arrangement of surfaces in later designs.

To get comparable answers on boiler costs, the designer must take into account the fact that the heat input and primary steam output of the reheat unit will be less than those for the non-reheat unit, when both are designed to produce the steam required to generate the same number of kilowatts from the same primary steam conditions and at the same boiler efficiency and draft loss.

Therefore, the width of the reheat unit will be smaller. The non-reheat

* See ELECTRICAL WORLD, October 18, 1941

unit will have more economizer surface to make up for the heat absorption of the reheat surface. Economizer surface, in general, is less costly than reheater surface because some alloy materials are required in the reheater.

Design and price studies have been prepared for 60,000-kw, 80,000-kw, and 125,000-kw units, some designed for liquid-ash removal, other for dry-ash removal. Typical maximum load steam requirements specified by various companies for these units are approximately those indicated in the accompanying table.

The design and price studies made to date indicate that, for equal generation of kilowatts, the reheat boiler unit designed for 1500 psi and 1000 F costs about 5% more than the non-reheat boiler. The difference in price between the reheat and non-reheat boiler is approximately the same for the 60,000-kw and the 80,000-kw units whether designed for liquid-ash removal or dry-ash removal.

Modern Reheat Boilers

W. S. PATTERSON
Combustion Engineering Co

WHEN ALL superheating and reheating can be accomplished with convection surface, modern reheat units are not much different in appearance than large non-reheat units, since the reheater is simply placed between the primary and secondary superheater. The secret of this simplicity lies in the ability to design a unit with tilting burners which control the temperature of the gas leaving the furnace.

By properly proportioning and locating the reheater, the final reheat and superheat temperatures are both controlled by burner tilt, but the tilt angle is automatically actuated by changes in reheat temperature. The temperature of primary steam may require supplementary control by spray de-superheating.

Steam pressure drop between high pressure turbine exhaust and low pressure turbine inlet must be kept to a minimum in order to obtain maximum efficiency with the reheat cycle. However, a reasonably large pressure drop of 20 to 25 psi must be taken across the reheater proper, to insure adequate steam distribution and protection against over-heating in individual circuits. Steam piping to and from the reheater must therefore be designed conservatively to reduce line losses.

The almost complete absence of convection steam generating surface will be noted in all modern reheat boiler units.

One of the largest high pressure topping installations employing an integral convection reheater is that at Montaup Electric Co where the boiler is designed for 2000 psi with primary steam temperature of 960 F and reheat of 765 F.

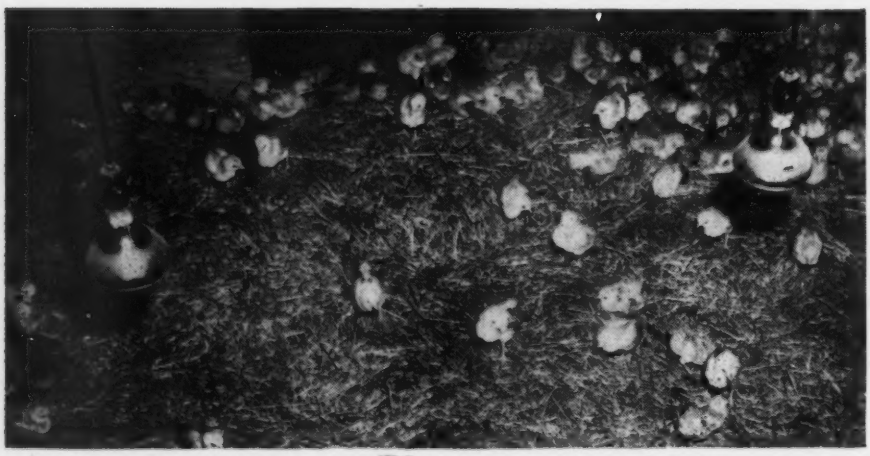
Reheat units will normally be base-loaded whenever possible in order to realize the approximately 5% lower fuel consumption. However, it is a distinct advantage to have a unit capable of maintaining the design maximum steam temperature from both primary superheater and reheater at reduced output. The method of steam temperature control used on these recently designed units is admirably suited to accomplish this result with automatic control.

Steam Generating Equipment For Resuperheating Cycles

MARTIN FRISCH
Foster Wheeler Corp

1—STEAM GENERATORS for turbine generators employing resuperheating cycles cost little if any more and may, for a small steam temperature control range, cost less than steam generators for non-resuperheating units for the same turbine capability and primary steam conditions.
2—Resuperheating units with superheaters and resuperheaters entirely of the convection type are more difficult to design for low furnace exit temperatures and are more restricted as to choice of fuel than the non-resuperheating units.
3—Resuperheating units with radiant superheaters and resuperheaters are not restricted as to choice of fuel. While more expensive for small steam temperature control ranges and high furnace exit temperatures, they become cheaper than units of the exclusively convection type for furnace exit temperatures under about 1,960 F for the 1,450-psi and about 2,130 F for the 2,000-psi cycle.

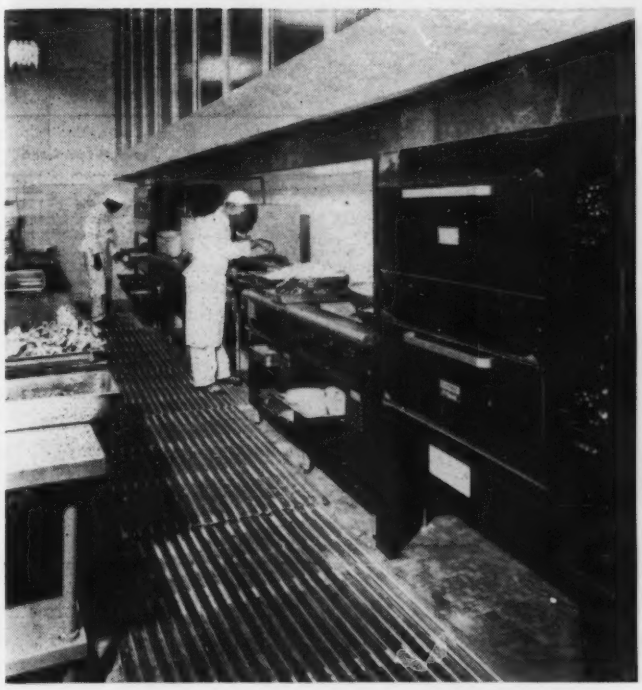
Infrared Lamps Applied to Keep Chicks Warm



INFRARED 250-watt R-40 lamps are used in hoverless brooding of baby chicks

A STUDY is in progress to cut housing cost for brooder chicks at the electrical experimental farm of Wisconsin Utility Association.

In the chickery, three 250-w R-40 lamps are being used for hoverless brooding of 325 chicks. Big advantage is that an inexpensive, single wall brooder house without insulation can be used. The lamps heat the chicks rather than the air that surrounds them. There is no problem with condensation. The chicks are normally well distributed over all the floor space and consume approximately 15% more feed.



ECONOMY ROW in Britling kitchen includes four heavy-duty ranges, a two-deck roasting oven and two heavy-duty fry kettles

CAFETERIA CUSTOMERS eat an average of 75,000 meals a month in this and adjoining Britling dining rooms

Electricity Cost, 1/3 Cent per Meal

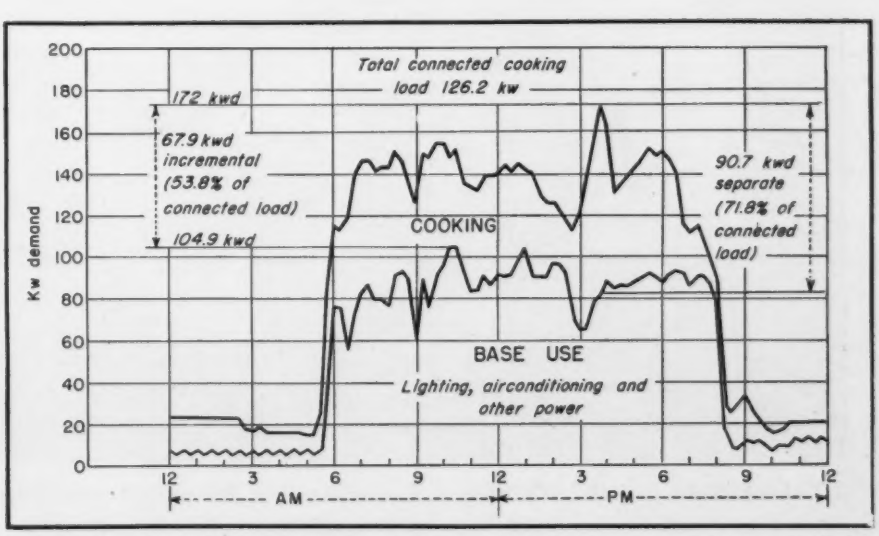
Test data show that saving from reduction in meat shrinkage more than pays for electricity used in cooking . . . Fry kettle again the "foot in the door"

ELECTRIC COOKING has paid off for Britling Cafeteria Co, Inc, operator of three of the favorite eating places in Birmingham, Ala. In the one Britling restaurant now completely electrified, the net result has been a lower cost per cooked meal of maintenance and of operation, and a saving of 800 lb of meat a month through decreased shrinkage.

In a 31-day test made by Birmingham Electric Co engineers, with 82,263 average meals per month, the average use and cost of energy per meal were 302 whr and 3⅓ mills respectively.

Britling has a connected load of 216.575 kw, of which 126.2 kw is cooking load. The cafeteria has an average monthly energy use of 57,840 kwhr, of which 24,853 kwhr, or 43% is for cooking.

Two three-deck bake ovens, four range tops, two fry kettles, one roast and one bake oven, two hot food tables and six coffee warmers have been installed, in addition to refrigerators, dishwashers, and other accessories. Air conditioning equipment totals 70 hp, while general and sign lighting adds 27 kw.



TYPICAL DAY PEAK DEMAND is 172.8 kw, of which 90.7 kw is cooking load. Peaks of cooking and other loads are widely separated, thus the incremental cooking demand of only 67.9 kw is considerably less than the maximum power requirement

Before deciding on all-electric equipment in this cafeteria, John H Holcomb, Britling president, traveled 10,000 miles while visiting electric cooking installations at the Mills Res-

taurants in Cincinnati and Cleveland; the S & W Cafeterias in Atlanta, Knoxville and Chattanooga; Morrison Cafeterias in Tampa, Mobile and New Orleans; and the Forum Cafeterias in Chicago, St. Louis, Los Angeles, San Francisco and San Diego.

The initial electric cooking equipment was installed prior to the war, and the remainder since. The change-over to all-electric operation was interrupted by the war and delayed further by shortage of equipment. But now the job is complete and is more than paying its way. The tests conducted by the utility engineers indicate a saving of more than 16% in meat shrinkage over that obtained with gas oven roasting equipment. Approximately 4,900 lb of meat were used per month as against 4,100 lb now, without a decrease in number or size of servings. The estimated saving of 20% in meat cost amounts annually to $5,760, nearly twice the cost of electricity for cooking.

TABLE I

Operating Data—Britling Cafeteria

	Total	Cooking alone	Percent
Connected load (Kw)	216.575	126.2	58.2
Demand (15 min (Kw) 3:45 p.m.)	172.8	90.7	52.5
Incremental demand (Kw)	172.8	67.9	39.3
Average energy used per month (Kwhr)	57,840	24,852	43.0
Incremental cost (Av. per Mo.)	$744.67	$271.26	36.4

Average watt-hours per meal	302
Average cooking energy cost per meal	0.33¢
Average No. of employees	120
Average No. of employee meals, monthly	7,440
Average No. customer meals, monthly	74,823
Average customer check	59¢

The Britling installation was started when Birmingham Electric gave a demonstration of the advantages of electric fry kettles and offered a 90-day free trial. The "foot-in-the-door" won by the fry kettles, plus close utility dealer cooperation in sales effort, had the desired result of complete change-over from gas to electric cooking. Now the cafeteria management is planning to switch to electric cooking in its other two establishments.

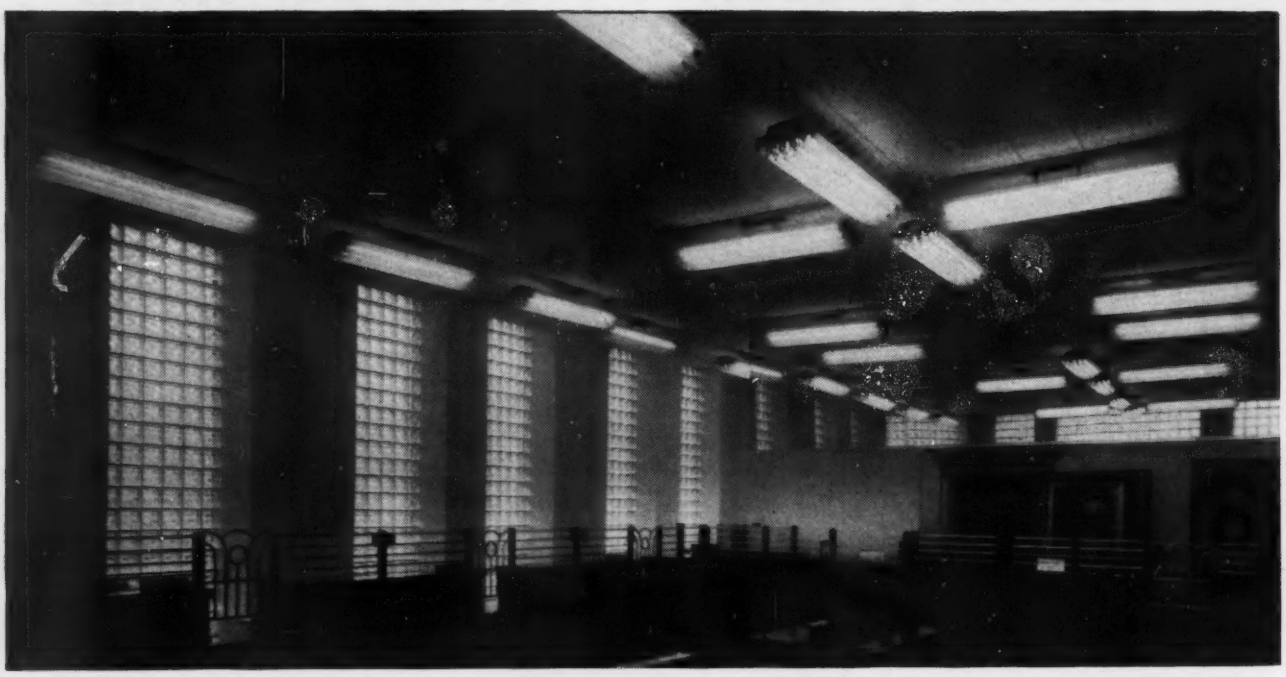
TABLE II

Cooking and Other Electrical Equipment Britling Cafeteria

No.	Equipment	Size	Total Kw	Age	Condition
1	Bake Oven	3-deck	12.6	New	Excellent
2	Range Tops	.....	31.8	New	Excellent
2	Fry Kettles	25-lb.	14.0	5-yrs	Good
2	Range Tops	.....	24.9	New	Excellent
1	Roast Oven	2-deck	10.0	1-yr	Excellent
1	Bake Oven	3-deck	12.6	2-yr	Excellent
2	Hot Food Tables	.....	19.3	9-yrs	Excellent
6	Coffee Warmers	2-Unit	1.0	2-yrs	Excellent

Walk-in Refrigerator	5 hp
Reach-in Refrigerator	1/2 hp
Ice Cream Comp.	1/2 hp
Ice Maker	2 hp
Dishwasher (2-2 Hp. Mo.)	4 hp
Slicer	1/2 hp
Dough mixer 10 qt (.7 kw) } Exhaust fan, 30" (.3 kw) }	1 kw
Air Conditioning	70 hp
General Lighting	19 kw
Signs and Marquee	8 kw
Mixer	1/3 hp
Potato Peeler	1/3 hp

Fluorescent Lamps Increase Attractiveness of Bank

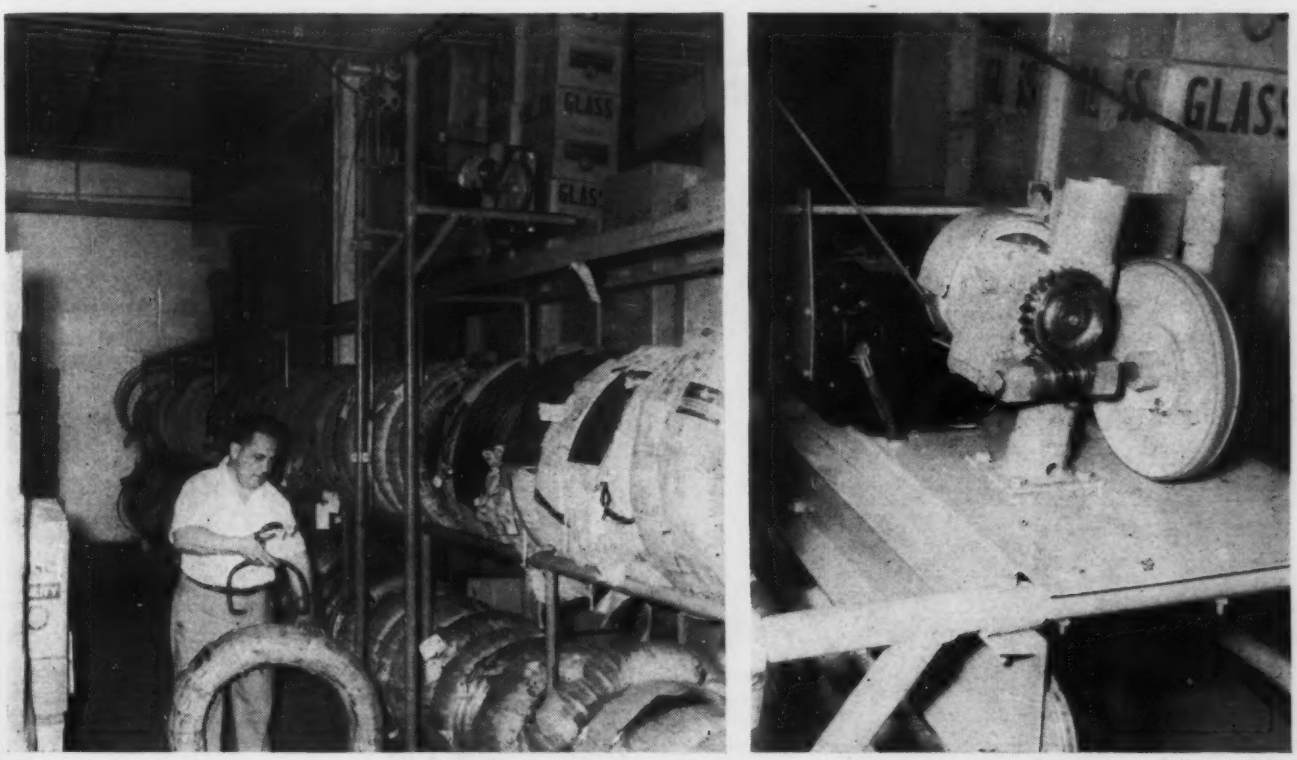


THE BANK OF FUQUAY SPRINGS, N. C., got "something different" with this lighting installation designed by CP&L Co engineers

When Robert E. Prince, president of the Bank of Fuquay Springs, N.C., asked Carolina Power & Light Co engineers to give him "something different" in lighting, G. O. Green of the commercial sales staff designed this unique layout which has attracted wide attention. There are twenty-eight fixtures suspended 1 ft from a 13-ft ceiling. Each fixture contains four 4,500-deg 40-w fluorescent lamps. Fixtures are glass-louvered, with strip of diffusing glass under each fluorescent tube.

Before the installation, intensity, was only 13 ft-c. The new lighting provides 45 ft-c in the public lobby and 50 in the bookkeeping department where there is a single row of 8 fixtures. Efficiency and comfort of the employees have been increased by this installation, which in addition, has greatly improved the attractiveness of the bank.

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



RACK AND HOIST combination (left) makes handling of coiled wire easier in the storeroom. Tubular rack with two tiers holds coils vertical, taking less floor space. Motorized hoist (right) travels along rack to lift and lower coils

Wire Handling Eased by Rack and Hoist

THE DIFFICULT and unwieldy job of handling coiled wire in the store room, and at the same time providing more space and better housekeeping, was solved by the Columbus Division, Georgia Power Co, with the shop-made electric hoist shown.

A two-tiered tubular steel rack was built along the wall to accommodate coils in an upright position. The rack covers approximately 70 sq ft of floor space, about one-fifth the space required when coils were formerly stacked on the warehouse floor. It will hold approximately 100 coils, or about 20,000 lb of wire. Coils are accessible for selection and the manner of stocking facilitates inventory control.

The hoist was developed from materials found in the shop. Its mechanism for lifting 200-lb coils employs a wire-rope drum driven by an electric motor through a worm-gear reduction unit.

The wire hoist rope is fitted with a set of hinged hooks, somewhat resembling ice hooks, for grasping the coils of wire. The motor is operated by a slide rod control for raising and lowering operations. This rod is pushed in the direction the cable is to travel. Releasing the control stops the operation. This is accomplished by a unique brake drum and spring arrangement mounted on the motor shaft. A limit switch stops the motor automatically when there is an overload.

The entire mechanism is mounted on a carriage fitted with small wheels which travel along a steel track mounted above the tubular rack.

Lifting and lowering operations take about five seconds. The hoist can be easily operated by one man, whereas before it required two men to lift the coils.

Fiberglas Used as Series Cutout

FIBERGLAS CLOTH is being employed as a series cutout between the lead-in wires of Westinghouse gas-filled lamps used on the New York Subway, where twenty lamps are operated in series on a 600-v d-c circuit. The nominal operating voltage of each lamp is 30 v.

By inserting the Fiberglas between

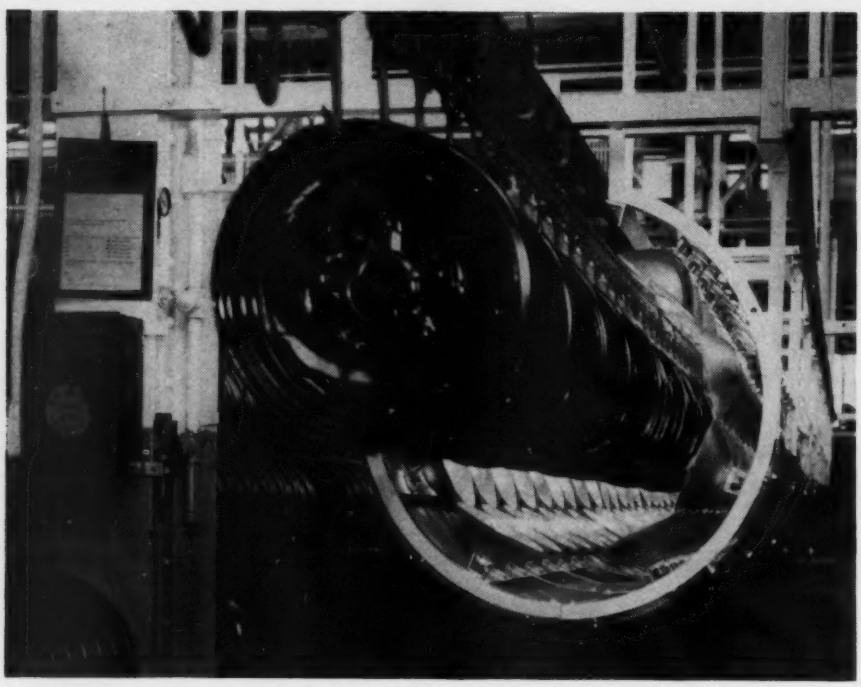
the lead-in wires, the necessary critical spacing is maintained. A strap of nickel around the wires holds them tight against the Fiberglas.

When the filament in any of the 20 lamps fails, the series circuit is momentarily broken and a potential of 600 v is impressed across the lead-in wires of the burned-out lamp. An immediate insulation breakdown occurs through the interstices of the Fiberglas as the gas acts as a conductor. The result is a fusing together of the wires to maintain the series circuit.

The cutout will operate without failure at 200 v when sealed in the lamp and at 500 v in the open air.

Using a quality control test devised by Westinghouse engineers, it is possible to check the breakdown characteristics of this type of cutout before it is sealed into the lamp, without destroying its usefulness.

How to Prevent Fires in Infrared Driers



INFRARED TUNNEL for drying automobile wheel rims after enameling process

FIRE PROTECTION of infrared dryers calls for various precautions against overheating, mechanical troubles, and under-ventilation. The Associated Factory Mutual Fire Insurance Companies recently studied 38 dryer fires covering a 7-year period. The lamp banks were used for drying sprayed, dipped, and brush-painted metal parts, impregnated coils of insulated wire, and coated paper, cloth and wood.

The principal cause of such fires was ignition of paint residues, flammable vapors, cloth or paper by hot parts of broken lamps. These breaks were due to paint dripping from materials being dried, and from the falling or bumping of objects improperly hung on conveyors. A few lamps cracked or broke from unknown external causes. Leading cause of most of the remaining fires was heat from the lamps which either ignited work stalled en route through the dryer or set fire to accumulation of residue or combustible parts of dryers.

The principal damage was shattering of hot lamps when suddenly cooled by water or other extinguishing liquids. The insurance companies recommend an extinguishing agent which will not cause this damage. Sudden rise of temperature due to fire may also break infrared lamps.

Preventive Suggestions

1. Protect lamps from spray, drip, splash or condensation which may break them or ignite by overheating. Safeguard lamps against mechanical breakage by work on conveyors.

2. Prevent hot parts of broken lamps from falling into dip tanks, or upon combustible work, deposits of paint or accumulations of debris.

3. Provide sufficient dryer ventilation to prevent formation of combustible or explosive atmospheres in contact with the lamps.

4. Provide interlocks to cut off the lamp current when the conveyor stops, ventilation fails, or a breakage occurs in continuous paper or similar material in the dryer.

5. Segregate dipping or spraying processes using infrared dryers and protect against floor leakage.

6. Use only CO_2 or dry chemical extinguishing equipment (fixed or manual type) in infrared dryers. Tests at the Factory Mutual Laboratories show that CO_2 will not break the hot lamps even when discharged directly upon them in the form of "snow". Lamps should also be protected from water discharged from sprinklers.

7. Infrared lamp dryers should be built of strictly non-combustible materials. Proper installation and maintenance of all electrical equipment is vital.

8. Avoid changes or experiments in infrared dryer operations without complete safeguards. Extreme care must be used with portable infrared drying lamps, particularly in hazardous locations.

Effect of Weather on Regional Peaks

APPROXIMATE EFFECTS of weather on power system loads in central New England were recently evaluated by C. P. Corey, in a talk before the American Society of Civil Engineers at Boston. As chief load dispatcher for the New England Electric System, Corey stated that approximate

INSTRUMENT TRANSFORMERS

5-KV for Outdoor Service

Mount in any position to suit your convenience

CONVENIENT MOUNTING

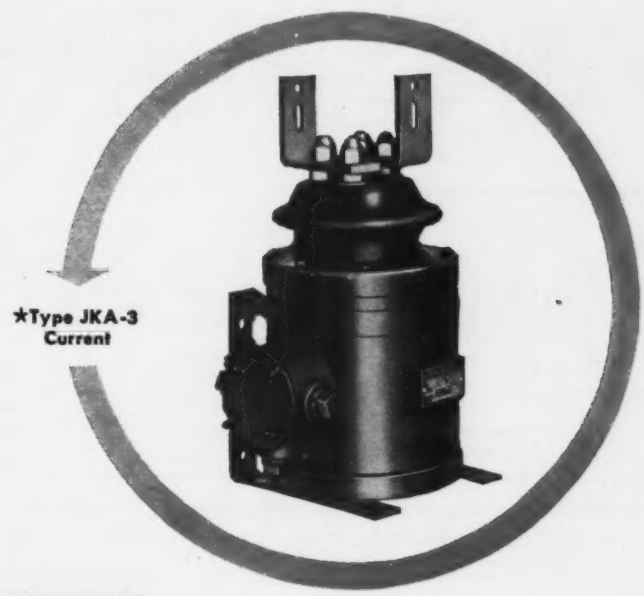
These transformers are designed for convenience of mounting in any position—vertical, horizontal or inverted. This is made possible by the sealed construction, and made easy by the versatile mounting bracket.

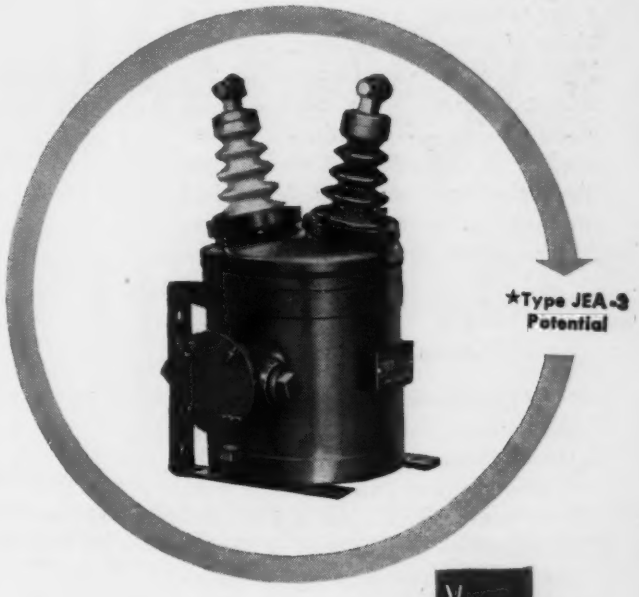
The sealed construction also eliminates the breathing action which could bring in harmful moisture as the transformer changes temperature. A sheet steel case with all joints welded, plus synthetic rubber gaskets under the primary terminal bushings and the secondary terminal block, assures its remaining weather-proof in any position.

How mounting in different positions is simplified—

A. The bracket is easily detached and can be changed in 90-degree steps.

B. Three one-inch conduit outlets on the secondary terminal compartment make connections easy from any direction.





APPLICATION

These transformers are designed for outdoor service and are suitable for operating meters, relays, and control devices. The potential transformer, Type JEA-3 is available in ratings 2400:120 volts and 4800:120 volts, 60 cycles. The current transformer, Type JKA-3 is available in all preferred primary current ratings, 10:5 amperes to 800:5 amperes inclusive. Both types have insulation for a 60-KV, full wave impulse level.

Your nearest G.E. representative will be glad to discuss specific applications. See him today, or write for Bulletin GEC-409 (JKA-3), and/or GEC-448 (JEA-3). Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

004-21

weather influence is as follows:

1. A dark weekday may increase demand 6% above a bright day.

2. From a calm winter day's base at 45 F, a load rise of about 0.15% per degree F drop may occur between 7 AM and 11 PM. Extreme wind may add 1.5% to this. Wider use of home insulation may shade this figure.

3. On a humid weekday in summer at 80 F, a load increase of about 0.2% per degree F rise may occur in the 80-95 F range between 7 AM and 5 PM. At 95 F, load may be reduced by cessation of business activities.

Large A-C Motors Started on Limited-Capacity System

C. C. CLYMER

Industrial Engineering Division
General Electric Co
Schenectady, N. Y.

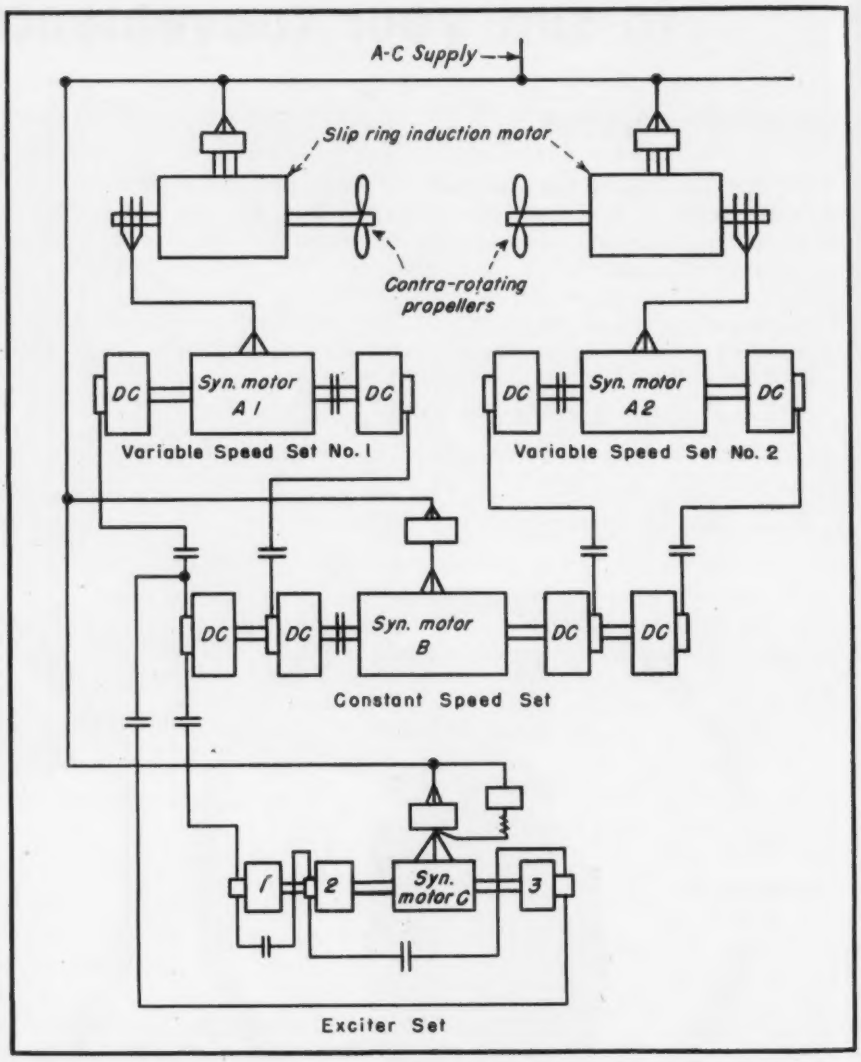
A SOLUTION is outlined for operating a 60,000-hp drive at the end of a long transmission line which had a maximum capacity slightly under 60,000 kva. The utility permitted an inrush of only 4,000 kva, and the load could be increased at a rate of 3,000 kw per min at unity power factor.

The drive consisted of two induction motors of the slip ring type, each capable of delivering 30,000 hp at 367 rpm, synchronous speed being 400 rpm and synchronous horsepower, 32,700. Each motor has its rotor connected to a synchronous machine of comparable rating. The synchronous machine *A* is driven by two adjustable speed d-c machines. If these synchronous machines are operated so as to produce 60 cycles, then the induction motors can be excited through the rotors, and by matching the line voltage and frequency the stators may be connected to the line with negligible disturbance.

Method of Starting

The installation includes a variable speed inverter set and a constant speed converter set. If necessary, the constant speed set can be started from the d-c end, reducing the initial starting inrush to any desired minimum value. The drive is now connected to the line and the load may be built up at any preset rate. By controlling the speed of the synchronous machine *A* through d-c machines, the speed of the induction motor is controlled, the speed being a function of the algebraic difference of the frequencies. The system load can thus be built up in, say, 15 min at a uniform rate, and reduced in the same manner.

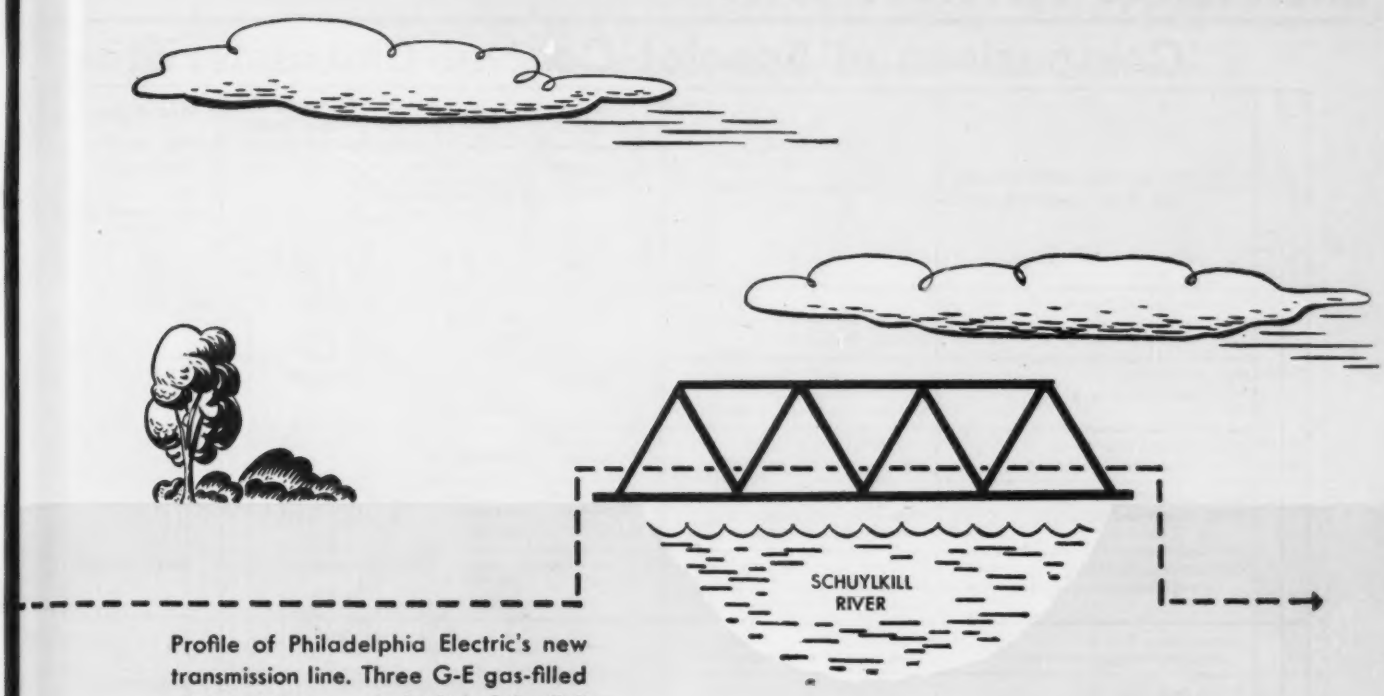
Since a synchronous machine is connected across the rings of the induction wound-rotor motor, the power factor of the latter can be controlled at all speeds and loads.



DRIVE ARRANGEMENT to start two 30,000 hp induction motors on a transmission line of limited capacity and operate at unity power factor. Exciter set connections indicate method used to start and synchronize the constant speed set

To date such drives have been the fan or compressor type with the torque varying as the square of the speed. This permits the use of d-c machines with approximately 5/27 of the rating of the wound-rotor motor. A range of 80 to 1 with an accuracy of ¼ of 1% has been obtained. The d-c power necessary to accomplish this on a pair of fans absorbing 60,000 hp is 8,400 kw. In this application two motors were used to drive contra-rotating propellers which for aerodynamic reasons must be operated as a unit.

Referring to the schematic diagram, the exciter set *C* is used to start and synchronize the constant speed set *B*, such connections being shown. After set *B* is synchronized, the particular exciters supply excitation for the variable speed sets.



Profile of Philadelphia Electric's new transmission line. Three G-E gas-filled pipe cables now help link Schuylkill with various substations. Note sharp variations in elevation.

Found a Simpler Way!

GAS-FILLED PIPE CABLE

One of Philadelphia Electric's problems in planning for additional capacity was the selection of transmission lines.

Overhead wires and oil-pipe systems had to be ruled out in certain areas.

For those lines involving severe profile conditions, the engineers, working with General Electric, decided to use gas-filled pipe cable. Not only has it eliminated the problems of a varying profile, but it gives Philadelphia Electric a simpler system as well.

Gas-filled pipe cable eliminates many of the accessories that oil-pipe systems require, and also promises lower maintenance costs because it's more self-supervising.

When you need a high-voltage cable, General Electric engineers can help you select the right type for the job. G.E. offers engineering, manufacturing, and installation experience with all types of high-voltage systems. *Apparatus Dept., General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

502-89

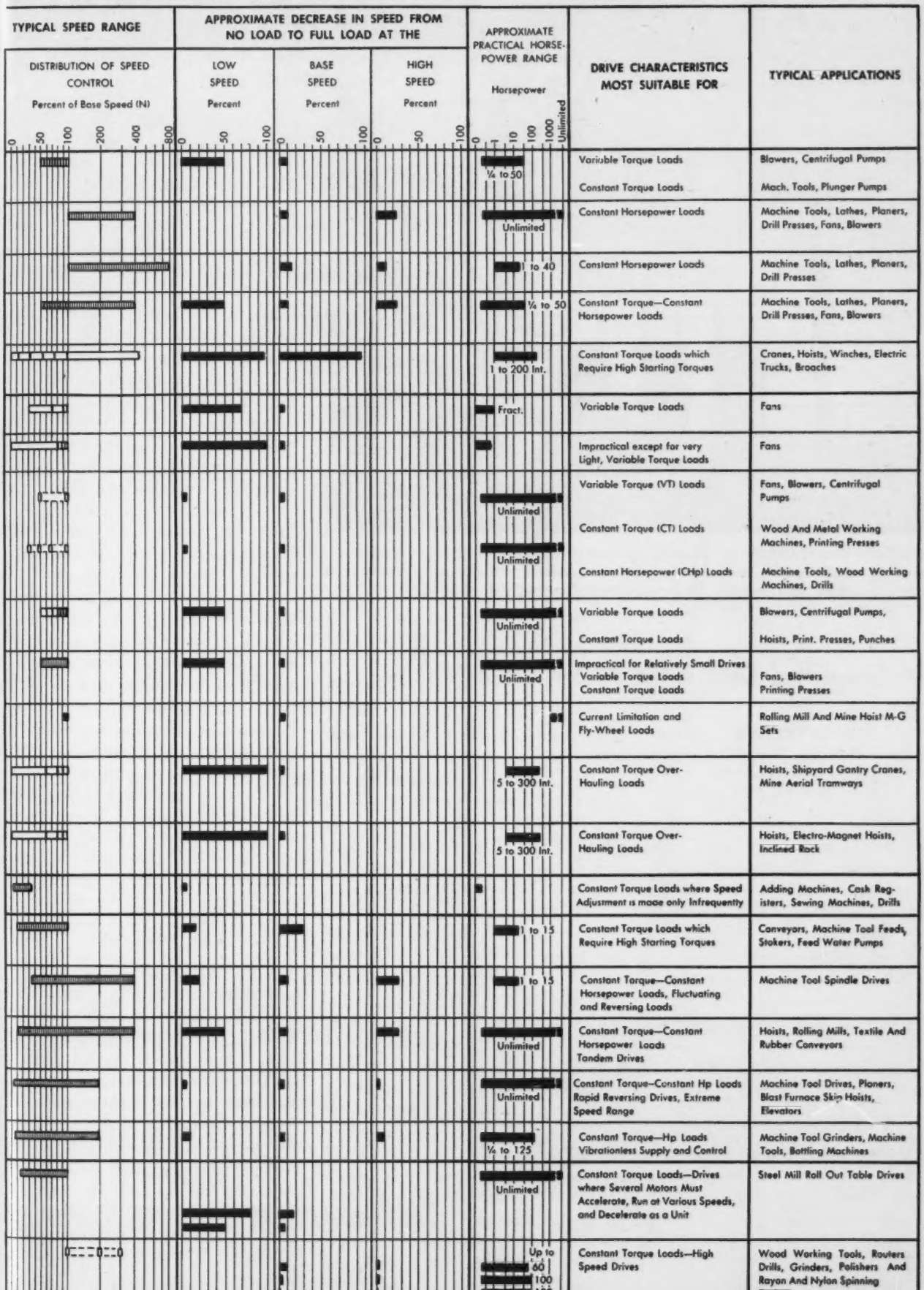
Comparison of Special Control Characteristics

POWER SUPPLY	MOTOR	TYPE OF DRIVE CONTROL AND TYPE OF MOTOR	TYPE OF CONTROLLER	RELATIVE ORDER OF: SIMPLICITY	RELATIVE ORDER OF: MOTOR SPEED (H=High B=Base L=Low)	RELATIVE ORDER OF: COST† In percent for a 10 Hp Drive, 1,800 RPM Approx. Max. Speed	DEGREE OF SPEED ADJUSTMENT	DRIVE MOTOR: TOTAL Ratio of High to Low Speed
D-C	D-C	Armature Resistance Control D-c Shunt-Wound Motor	Manually operated Rheostat Manually operated Drum	3	B=1,750 L=875	225 260		2/1
		Field Excitation Control D-c Shunt-Wound Motor	Manually operated Rheostat Magnetic Starter and Field Rheostat	5	H=1,800 B=450	475 510		4/1
		Special Field Excitation Control D-c Special Shunt-Wound Motor	Magnetic Starter and Field Rheostat	6	H=2,000 B=250	890		8/1
		Arm Resist and Field Excitation D-c Shunt-Wound Motor	Manually operated Rheostat Manual Drum and Field Rheostat	9	H=1,800 B=450 L=225	530 530		8/1
		Armature Resistance Control D-c Series-Wound Motor (Int. Rating)	Manually operated Drum Magnetic Controller and Master Switch	10	B=1,750 L=*	300 400		*
A-C	A-C	Primary Voltage Control A-c Single-Phase Capacitor Motor	Autotransformer and Selector Switch	2	——	♦		3/1
		Primary Resistance Control A-c 3-Ph Squirrel-Cage Motor	Resistor and Drum Controller	8	——	♦		*
		Pole Grouping Control A-c 3-Ph Squirrel-Cage Multispeed Motor	Manually operated Drum 2-Speed—1 Winding (VT) 2-Speed—1 Winding (CT) 2-Speed—1 Winding (CHp) Magnetically operated Controller 4 Speed—2 Winding (VT) 4 Speed—2 Winding (CT) 4 Speed—2 Winding (CHp)	4	B=1,740 L=870 B=1,740 3rd=1,155 2nd=870 L=580	100 100 150 260 300 400		
		Secondary Resistance Control A-c 3-Ph Wound-Rotor Motor	Primary Magnetic Starter and Secondary Manually operated Rheostat	7	B=1,745 L=875	210		2/1
		Secondary Resistance Control A-c 3-Ph Wound-Rotor Motor	Magnetically operated Primary and Secondary Controller	17	——	♦		2/1
		Automatic Secondary-Resistance Control A-c 3-Ph Wound-Rotor Motor	Torque Motor operated Liquid Slip Regulator	18	——	♦		1.07/1
		Primary Impedance and Secondary Resistance Control A-c 3-Ph Wound-Rotor Motor (Int. Rating)	Magnet-operated Reactor Contr. and Man. operated Master Switch	20	B=1,745 L=*	800		*
		Primary D-c Excit and Secondary Resis A-c 3-Ph Wound-Rotor Motor (Int. Rating)	Magnet-operated System Contr. and Man. operated Master Switch	19	B=1,745 L=*	980		*
≋	≋	Armature Resistance Control Universal Motor With Governor	Manually operated Snap Switch	1	——	♦		12/1
A-C	D-C	Series Adjustable Voltage Control D-c Series-Wound Motor	A-c Magnetic Starter and Man. operated Rheostat in D-c Circuit	11	B=1,750 L=175	500		10/1
		Self-Excited Adjustable Voltage D-c Shunt-Wound Motor	A-c Magnetic Starter and D-c Contr. and Man. operated Rheostat	12	H=1,800 B=450 L=150	1,000		12/1
		Separately Exc. Adjustable Voltage D-c Shunt-Wound Motor	A-c Magnetic Starter and D-c Contr. and Man. operated Rheostat	13	H=1,800 B=450 L=45	850		40/1
		Adjustable Voltage with Rototrol D-c Shunt-Wound Motor	A-c Autostarter and D-c Contr. with Rototrol and Man. operated Rheostat	14	H=1,800 B=900 L=15	1,080		120/1
		Electronic Adjustable Voltage Control D-c Shunt-Wound Motor	Mot-o-trol and Man. operated Rheostat	21	H=1,700 B=850 L=45	1,020		40/1
	A-C	Adjustable Frequency Control—M-G Sets A-c 3-Ph Squirrel-Cage Motor	Primary Magnetic Starter and Man. operated Rheostat in D-c Circuit D-c to A-c: M-G Set Motor not Compensated D-c to A-c: M-G Set Motor Compensated	16	B=1,740 L=290	1,500 1,750		6/1
		Adjustable Frequency—Induction Gen Set A-c 3-Ph Squirrel-Cage Motor (M-G Set) A-c 3-Ph Squirrel-Cage Motor (Syn M-G Set) A-c 3-Ph Synchronous Motor (Syn M-G Set)	Primary and Secondary Magnetic Contr. Primary and Secondary Magnetic Contr. Primary and Secondary Magnetic Contr.	15	H=5,400 2nd=3,600 B=1,800	850 ♦ ♦		3/1

NOTES — † Motors are for 3-phase 220-v a-c or 230-v d-c service — Open 40 C continuous rating. (The drive with the lowest cost is assigned a cost value of 100%). ♦Cost data not appropriate

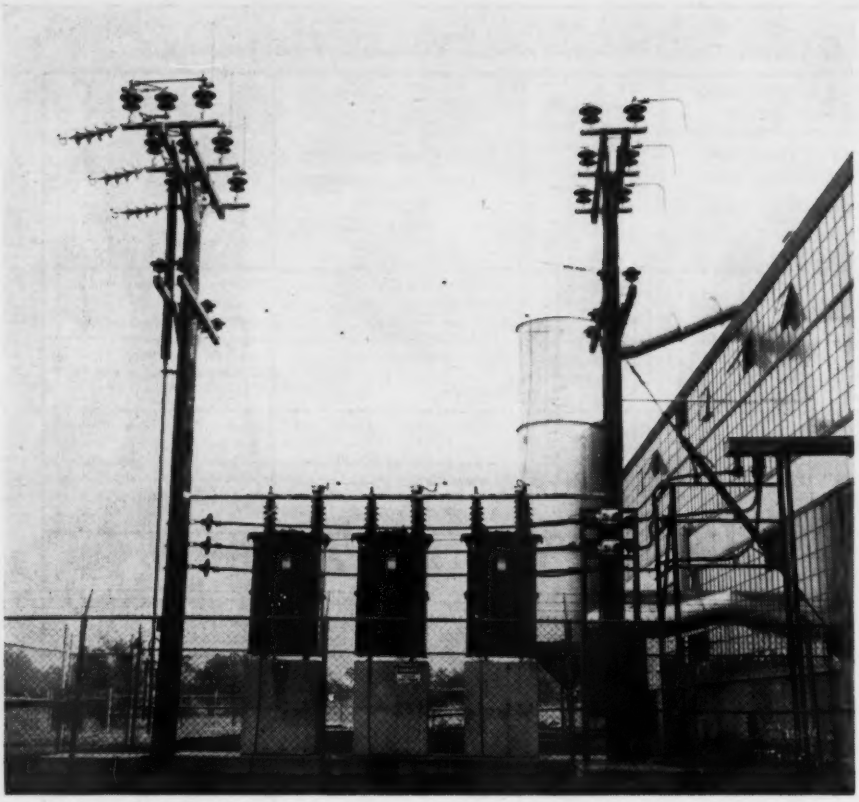
# of Electric Drives

R. B. IMMEL Control Engineer, Westinghouse Electric Corp, East Pittsburgh, Pa.



DRIVE CHARACTERISTICS MOST SUITABLE FOR	TYPICAL APPLICATIONS
Variable Torque Loads	Blowers, Centrifugal Pumps
Constant Torque Loads	Mach. Tools, Plunger Pumps
Constant Horsepower Loads	Machine Tools, Lathes, Planers, Drill Presses, Fans, Blowers
Constant Horsepower Loads	Machine Tools, Lathes, Planers, Drill Presses
Constant Torque—Constant Horsepower Loads	Machine Tools, Lathes, Planers, Drill Presses, Fans, Blowers
Constant Torque Loads which Require High Starting Torques	Cranes, Hoists, Winches, Electric Trucks, Broaches
Variable Torque Loads	Fans
Impractical except for very Light, Variable Torque Loads	Fans
Variable Torque (VT) Loads	Fans, Blowers, Centrifugal Pumps
Constant Torque (CT) Loads	Wood And Metal Working Machines, Printing Presses
Constant Horsepower (CHp) Loads	Machine Tools, Wood Working Machines, Drills
Variable Torque Loads	Blowers, Centrifugal Pumps,
Constant Torque Loads	Hoists, Print. Presses, Punches
Impractical for Relatively Small Drives Variable Torque Loads Constant Torque Loads	 Fans, Blowers Printing Presses
Current Limitation and Fly-Wheel Loads	Rolling Mill And Mine Hoist M-G Sets
Constant Torque Over-Hauling Loads	Hoists, Shipyard Gantry Cranes, Mine Aerial Tramways
Constant Torque Over-Hauling Loads	Hoists, Electro-Magnet Hoists, Inclined Rack
Constant Torque Loads where Speed Adjustment is made only Infrequently	Adding Machines, Cash Registers, Sewing Machines, Drills
Constant Torque Loads which Require High Starting Torques	Conveyors, Machine Tool Feeds, Stokers, Feed Water Pumps
Constant Torque—Constant Horsepower Loads, Fluctuating and Reversing Loads	Machine Tool Spindle Drives
Constant Torque—Constant Horsepower Loads Tandem Drives	Hoists, Rolling Mills, Textile And Rubber Conveyors
Constant Torque—Constant Hp Loads Rapid Reversing Drives, Extreme Speed Range	Machine Tool Drives, Planers, Blast Furnace Skip Hoists, Elevators
Constant Torque—Hp Loads Vibrationless Supply and Control	Machine Tool Grinders, Machine Tools, Bottling Machines
Constant Torque Loads—Drives where Several Motors Must Accelerate, Run at Various Speeds, and Decelerate as a Unit	Steel Mill Roll Out Table Drives
Constant Torque Loads—High Speed Drives	Wood Working Tools, Routers Drills, Grinders, Polishers And Rayon And Nylon Spinning Buckets

for 10 hp rating. * Indeterminate (Depends directly upon the load). ★ Practical only for a group of drive motors. ▲ Not practical below base speed. (Use multi-speed motors below base speed).



STEPDOWN SUBSTATION for industrial supply that resulted from efforts to simplify design. Note simple primary and secondary bus arrangement; separate pole mounting for switches and fuses; also movable concrete pedestal mounting for transformers that step voltage down from 34.5 kv to 460 v

Simplified Design for 34.5-Kv Substations

W. C. FEASTER
Technical Engineer
The Potomac Edison Co
Hagerstown, Md

EFFORTS by Potomac Edison Co engineers to simplify the design of 34.5-kv stepdown substations are typified in the pictured industrial station at Winchester, Va.

Among the novel features of the design is the use of movable concrete blocks as transformer pedestals. These blocks, which rest on the main concrete pad foundation, are moved with the transformer if they are changed for any reason.

Station Structure

The two poles that comprise the station structure support the air break switch, fuses, 34.5-kv primary and 460-v secondary buses. The incoming line is deadended to the switch base and the switch pole is guyed to the fuse pole, which in turn is guyed to ground. Wood arms are used throughout, including wooden operating rods between switch poles. A wooden insulator, provided in the pipe to the switch control handle, is operated from a concrete platform in which a ground mat is placed. This mat is connected to the operating handle and the station ground.

Line-type arresters are mounted on the transformers and connected directly to the bushings. Additional protection is obtained by explusion gaps on the line.

The secondary bus is strained between the two poles and connected to current and potential transformers on a steel frame at the right end of the station. This frame also supports the meter housing and from it the service is connected to the load side of the current transformer.

This design has proved very economical and reliable. No transformer failures from lightning have been experienced although several lightning arresters were so badly damaged that they had to be replaced.

Scheduling Pole and Line Inspection—III*

ON THIS SYSTEM the line inspector is required to report any recent distribution construction not conforming to company standards. He notes and reports any 3-wire secondary system which has a considerable majority of 2-wire services taken from the same side. During inspection tours he is required to read and re-set every thermotel installation except on 13.2-kv transformers. A list of such installations is compiled annually before March 22 and made available to the line inspector. Since he is required to see all parts of the system, the failure of a thermotel to appear on the list is not considered a reason for not reporting it.

General Street Lighting. The annual inspection tour of metal poles, including combination wood and metal (such as the "ornamental" type) and street light fixtures on wooden poles (where the lamp size exceeds 1,000 lumens) starts about Jan. 1 yearly. It has to be done by March 25. On this tour the line inspector makes necessary minor repairs. He reports if metal poles are bent, need painting or straightening, and if leads are broken or defective. He replaces incandescent lamp fixture shades, doors to bases or similar equipment. The inspection includes mast arms, brackets, and top light fixtures, with emphasis on lamp hangers, joints between metal members and fastenings, and metal members to wooden poles, but not the wooden poles themselves.

Arc Lamp Poles

When examining ornamental arc lamp poles, attention is given to the general condition of the exterior of the base, column and fixtures. The top door to the lamp is opened and the latch condition checked. If inoperative, the inspector makes repairs or replaces the door. He also opens the door at the base of each pole, noting the condition of the interior and especially the cut-out box. He pulls the plug and replaces it, noting the condition of the clips. Any needed repairs or replacements are reported. In in-

* Continuing a five-article series which began in ELECTRICAL WORLD, Nov. 20, 1948, page 110.

Line is 18 Times More Resistant Un-Protected H-Frame

In the interests of technical progress of high voltage transmission, this series of operating reports is presented to the Electrical Industry. As a manufacturer of insulators and hardware, the Ohio Brass Company is vitally concerned in this development. These reports have been compiled in book form, and are now available to power company engineers on request.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ontario

2859-H

specting the bases of steel poles, the edge of the concrete collar is always checked for corrosion. All doors to these lamps are set with putty when being replaced.

Pole Butt Inspection. During line inspection the butt of each pole selected for such examination is checked. This is done as a part of the regular inspection tour and is not the object of a special trip. In such work the pole condition is examined to at least 10 in. below the ground if possible. This is done by probing with a pole rod (a ¼-in. rod sharpened to a point and equipped with a handle to facilitate probing).

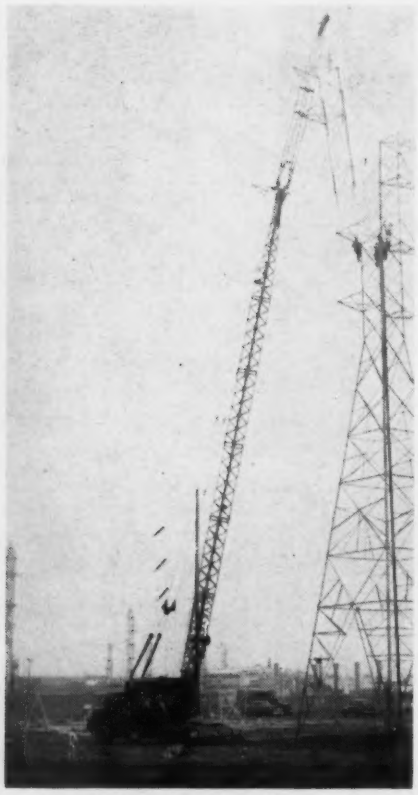
If the pole is set in concrete or other surfacing material, examination is by an increment borer driven in at an angle of about 45 deg at the ground level. From one to three borings are made at each pole. The increments obtained are split by a special sharp knife, and the wood thus exposed examined, rather than that on the outside of the increment. Holes left by the increment borer are filled with wooden plugs carried in company stock. If the use of the increment borer is impracticable on a pole, the surfacing material is sufficiently chipped away to permit examination by the regular method. Material is carefully replaced after this is done.

The line inspector climbs to the top of every pole whose butt he examines. He checks its condition from ground line to top, including crossarms and both power and communication equipment (in joint construction). He is required to estimate the number of years that the pole may be expected to remain in service and write this on the pole record. When making this estimate he considers the condition of the pole and crossarms, guys and other attachments tending to keep the pole up if the butt fails. System standards aid him in estimating the life of the pole.

Mobile Cranes Speed Tower Erection

T. M. BLAKESLEE
Engineer of Transmission and Communications
Los Angeles Department of Water and Power

TO SPEED erection of steel transmission towers, Los Angeles Dept of Water and Power is relying heavily on truck-mounted cranes of the type shown. Mobility and maneuverability of this crane result in fewer and heavier lifts which mean appreciably less time required per tower.



TRUCK-MOUNTED CRANES used extensively by Los Angeles Department of Water and Power step up steel tower erection. The 145-ft boom, highest used to date, is assembled and raised at the site by the crane without assistance

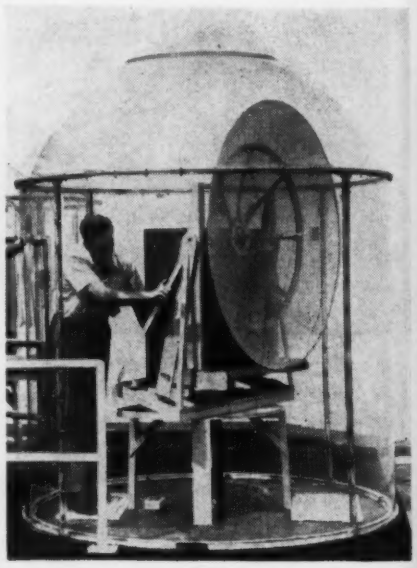
The unit has a 35-ft jib and a 110-ft boom consisting of four 20-ft sections and two 15-ft sections, all field assembled and raised without assistance. A 145-ft boom was used to erect two 144-ft towers of a 7-mile, 138-kv tower line in the Los Angeles area. For work on smaller towers, 20-ft sections were removed from the boom. Capacity of 5,000 lb at maximum height exceeded the heaviest lift required on these towers.

Stability of the truck is aided by dual tires front and rear and outriggers providing a base 11-ft wide.

Plastic Bell Jars Protect TV Antennas

UTILITY ENGINEERS who are experimenting with microwaves for relaying and control may find the following practical idea used for television antennas of interest. Microwave antennas mounted high on the Empire State and RCA Buildings are enclosed in Plexiglas to keep the light-weight parabolic antennas from vibrating in the wind, a cause of distorted television reception. The dome also guards the costly apparatus against moisture, dirt, birds and ice.

The housings are made of shatter-resistant Plexiglas ½ in. thick; each is 6-ft upright cylinder, 7-ft in diam and topped with a hemispherical dome formed to a depth of 30 in. from a sheet of plastic 7-ft 4-in. square.



MICROWAVE ANTENNA is protected by big transparent dome of formed plastic

The plastic material passes microwaves without perceptible distortion. It is easily formed to exact curvature and dimensions; is light in weight; has shatter-resistance with inherent resiliency; and is virtually impervious to extremes of weather and continued exposure to sunlight. Its near-perfect transparency allows quick inspection of the apparatus within, and simplifies visual aiming of the antennas.

To prevent development of excessive heat in summer, or freezing condensation in cold weather, forced air (heated electrically in winter) enters through a floor register and is exhausted through hinged louvers on the side.

The little girl in the illustration knows what she wants because Planned Lighting pointed it out to her . . . drew her attention . . . kindled her desire. Yes . . . here is positive evidence of a lighting installation—carefully planned, carefully engineered—to do a store selling job.

And here, too, is evidence of a luminaire that was carefully designed and constructed to fit the most exacting layout specifications. The Westinghouse "Merchandisers" (designed specifically for stores) . . . blend with modern store surroundings . . . put the light on the merchandise . . . combine glare-free general illumination with high-intensity spotlighting . . . provide flexibility of mounting and ease of maintenance.

You can boost your commercial lighting sales volume by recommending the luminaires designed for stores . . . the Westinghouse "Merchandisers".

A Westinghouse Lighting Engineer will gladly co-operate with you and the Electrical Contractor on the job to give your customers the benefits of Planned Lighting. Call your Westinghouse Distributor today for the new booklet B-4076, "Smart Selling Starts with Planned Lighting" or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-04203-B

The Westinghouse "Merchandisers"

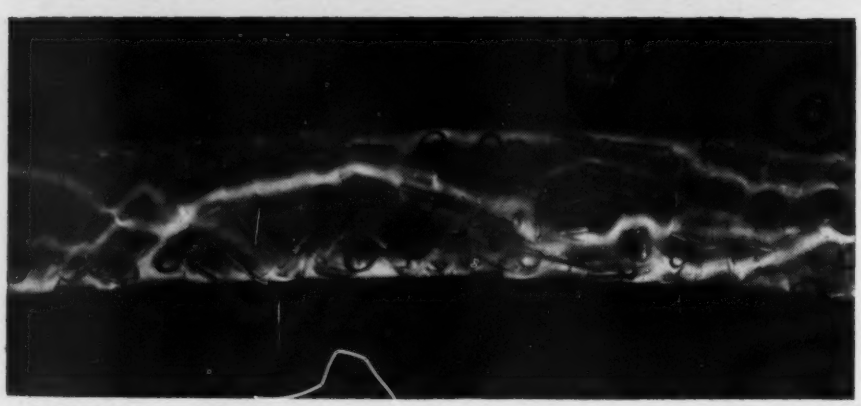
The Westinghouse "Merchandisers" combine efficient general lighting with accent lighting for featured merchandise. Spotlight units may be placed at any point where highlighting of special displays is desired. The "Merchandisers" are available in four sizes: two 4-foot units using two or four 40-watt lamps; a 5-foot unit using two 85-watt lamps; and an 8-foot unit with four 96" Slimline lamps. The complete family of "Merchandisers" is designed to give controlled brightness between the fluorescent lamps and the ceiling with effective louvering to minimize glare.

WESTINGHOUSE

Planned Lighting *Pays*

COMMERCIAL • INDUSTRIAL • FLOOD • STREET • AVIATION

LOAD BUILDING



FLAME EFFECT is conspicuous in comparison with ordinary neon tubing used in the candle and its holder. Detail shows erratic paths of light through beads packed in tube

Flame Effect Neon Sign

EYE-CATCHING NEON SIGNS, which "flicker" in flame effect and do not require any special switching device, now are making their appearance. The tubes contain large numbers of hollow glass "beads" as well as the neon gas. The beads cause the current to create odd luminous patterns as it passes through the gas around the edges and through the hollow centers of the beads. Standard neon transformers are all that is required for operation. An accompanying illustration shows one of the few "flicker signs" that have thus far been fabricated. The maker is the Greiner Glass Blowing Laboratory of Los Angeles, Cal.

Electric Annealing Raises Production 238%

GREGG DIAL
Connecticut Light & Power Co
Waterbury, Conn.

STAINLESS STEEL is electrically annealed in a 100-kw furnace at Landers, Frary & Clark's New Britain, Conn., plant with economical results. The installation is of the continuous roller hearth type. The heating chamber is 9.5-ft long and there is a cooling chamber 15-ft long. Including charging and discharging rollers, with 26- x 12-in door openings, the overall length is 32 ft. Entrance and discharge doors, as well as a door in between chambers, are automatically operated.

Cycle of Operation

In operation, a loaded tray of stainless steel spun and deep-drawn containers is continually held on the rollers at the furnace entrance. Whenever room exists inside, the door opens, the rollers speed up and the tray is rapidly transferred into the heating chamber (normal interior temperature 1900-1950 F), and the door closes. The work reaches the maximum temperature in five min. After 15 min in the furnace, during which time the work has been rolled toward the cooling chamber, the middle door opens automatically, the tray is accelerated into the cooling chamber and the door closes.

The cooling chamber has a fast-cooling section next to the heating chamber. This is equipped with two automatically operated fans which recirculate a prepared atmosphere over the work for a predetermined time and automatically stop. This fast-cooling section is water-jacketed and the temperature of the work drops to about 800 F in two min. During the rest of the period in the cooling chamber the temperature falls until hand removal of the work is feasible. When the tray reaches the discharge door the rollers speed up, the tray quickly leaves the furnace and the

NEW SLIDE FILM TO HELP YOU SELL THE SUNSHINE HOME!

Another General Electric Sales Aid for Planned Home Lighting

Here's a film you'll want to show to groups of every type who are interested in home lighting . . . home owners, architects, contractors, dealers, and your own lighting sales people. It will help support your Planned Lighting Program and build good will for *you*, too.

The new full color sound slide film, "The Green House", is an actual case history of what Planned Home Lighting did for a typical home. When customers see it, they'll quickly be convinced of the advantages of a Sunshine Home. And when you show it to people in the lighting business, they'll be better equipped than ever to push Planned Lighting with their prospects.

"The Green House" is the latest of the many promotional aids offered you by General Electric. Has 41 frames—with two records—one for consumers and one for the trade. Available at less than cost —$40—from your nearest G-E Lamp district office.

New Home Lighting Literature, too!

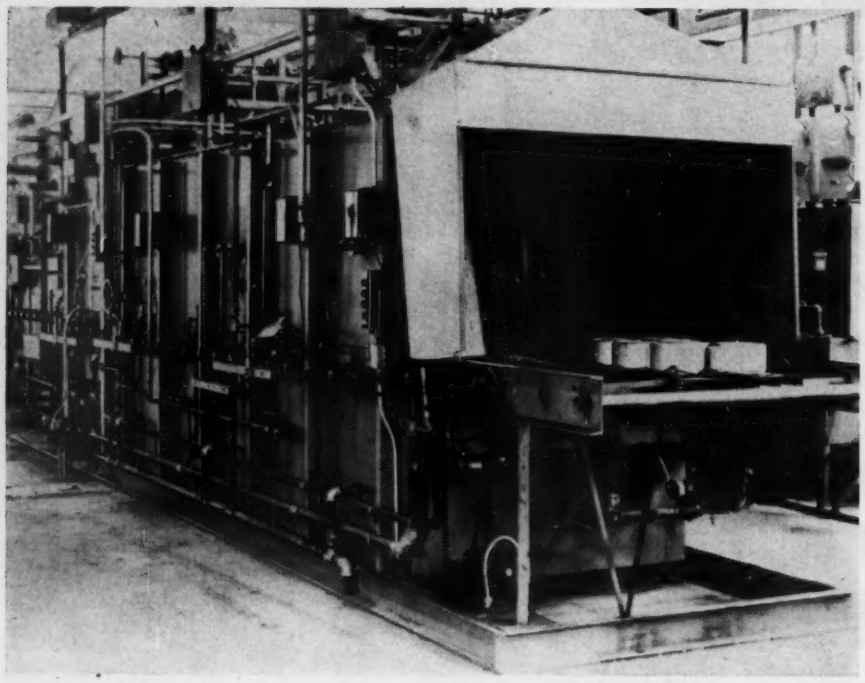
Just off the press are several colorful booklets on Planned Home Lighting and the Sunshine Home: "*How to make Homework Lighter*"; "*Planning your Sunshine Home with Lighting for Better Living*"; "*Lighting Ideas to Brighten your Home*"; "*Glamorize your Home with G-E Fluorescent Lamps in the New Units for Valance Lighting.*"

They're ideal handouts when you show "The Green House." Ask your G-E Lamps district office about them.

Lamp Dept., General Electric Co., Nela Park, Cleveland 12, Ohio.

G-E LAMPS

GENERAL ELECTRIC



DISCHARGE END of automatically-operated annealing furnace. Normally two trays are in the heating section, another is in the fast cooler and one or two are in the slow cooler

door closes. The only hand operation required is the loading or unloading of the trays.

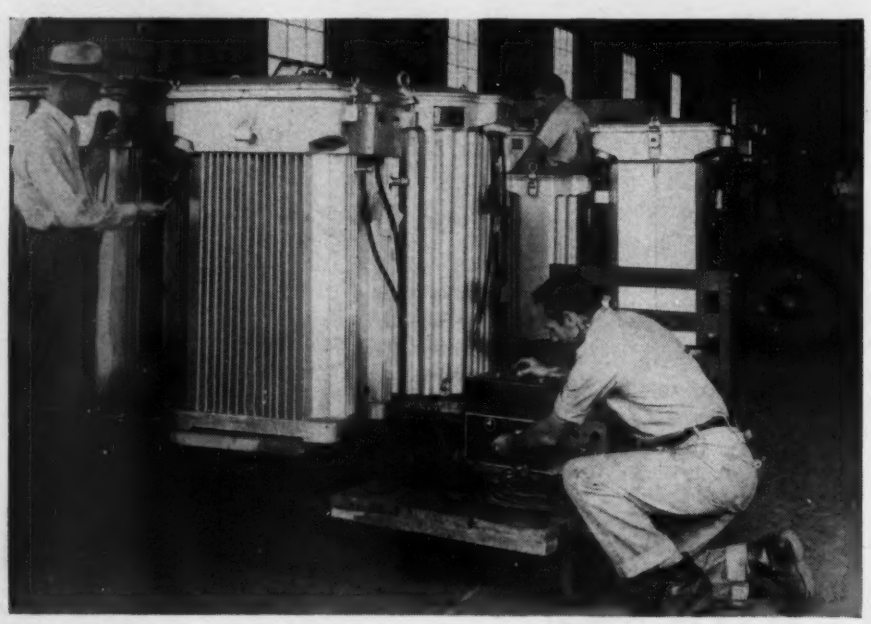
The prepared atmosphere is the product of combustion of a mixture of one part city gas and two and one-half parts air. The approximate analysis is 16% hydrogen, 1% methane, 10% carbon monoxide, 69% nitrogen, and 4% carbon dioxide. Dewpoint is about 80 F. The atmosphere converter consumes about 450 cu ft of city gas per hour.

When heating a gross weight of 550 lb per hr to about 1,900 F the energy consumption is about 80 kwhr, or 290 kwhr per ton. Compared with the labor cost due to the oil fired batch type furnace formerly used, the present labor cost is much lower. Production has increased from 130 to 440 pieces per hour. Rejections are fewer; production is streamlined; and pickling time is cut from 30 to 10 min.

Inventory Taking Speeded by Wire Recorders

PORTABLE WIRE RECORDERS have been used successfully by Southern California Edison to speed up inventory of general store equipment. Although the recorders have not yet been adopted for all company inventories, results show a definite saving in time over conventional inventory methods using standard check-off procedures.

The wire recorder was chosen because of its portability, long recording time of one hour per spool, and ease in making corrections. The four portable recorders used for inventory were powered by their own batteries and inverters, achieving six hours of operation on one charge. Total recording time of 48 hr, or an average of 12 hr for each machine, compares with one or two weeks normally required to complete this same inventory.



WIRE RECORDERS and punched-card tabulating machines proved very satisfactory when limited time available, during a change in accounting procedure, ruled out conventional check-off method

The inventory speed-up was necessitated by adoption of a new system for the company's materials and supplies accounting. The old inventory system could not complete the transformer section inventory in the required time; therefore, the new system using wire recorders and punched card tabulating machines was adopted.

Comparison Method

Before taking the inventory, stock shown on open ledgers was key punched on a set of cards. 1-hr spools were sent to the key punch operator, who took off serial numbers, ratings and prices, and put them on a second set of cards. The two sets of cards were then compared by machine, and those which failed to match were investigated. In most cases mismatching was due to misinterpretation of the recorded serial numbers or ratings, and was quickly discovered.

The NEW Guthlite* SWINGS DOWN on the MARVELOUS JACKNIFE HINGE!

This Magic Wand Does The Trick!

No wonder maintenance costs take a nose dive, when maintenance time is cut as much as 80% with GUTHLITE!

No more maintenance ladders! No more acrobatic porters! No more fuss, muss, bustle, or bother! Now, with the amazing new GUTHLITE, fluorescent maintenance is a fast, simple, floor-level job!

Just a twist of the wrist with the maintenance rod, truly a magic wand, and down swings the reflector on the patented Jacknife Hinge. Then speedily, safely, efficiently—lamps are replaced, starters changed, reflectors cleaned—then up swings the reflector to go on with its efficient lighting job!

There are dozens of facts you should know about the revolutionary new GUTHLITE. Get them all. Write today for Bulletin 3845 B

*Trade Mark.
U. S. & Canadian
Patents Applied for

THE EDWIN F. GUTH CO. • St. Louis 3

Leaders in Lighting Since 1902

NEW EQUIPMENT

Circuit Breaker

WITH interrupting periods of five or eight cycles and 20-cycle reclosing time, the Type FK-439, 69-kv, oil blast power circuit breaker is available in terrupting ratings of 1,000, 1,500 and 2,500 Mva, and continuous ratings of 600 and 1,200 amp. It is manufactured by the Switchgear Division of General Electric Co, Schenectady 5, N. Y.

Mounted in a 36-in. diam tank, the interrupter operates on a dual flow, cross blast principle. The actuating mechanism is a self-contained air-operated device.

Bushing current transformer pockets can accommodate a total of 12 transformers per breaker. Leads from transformers are brought through junction boxes and conduit to terminals in closing mechanism housing.

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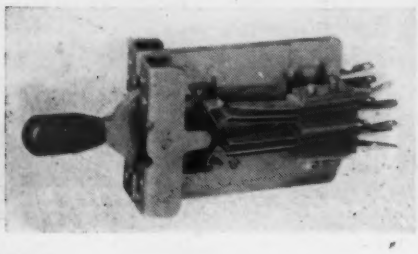
Small Switches

DEVELOPMENT of small lever type switches with shielding between switch assemblies is reported by General Control Co, 52 Chauncy St, Boston 11, Mass.



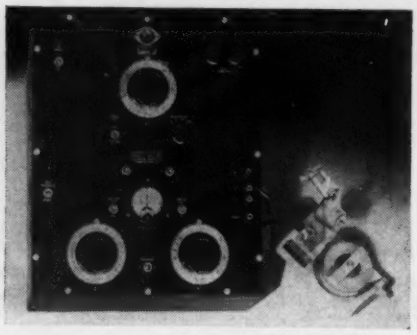
Illustrated is the Model MCT-4, which has mounting holes to fit standard mountings and a depth behind panel of 2 21/32 in., including terminals. The frame face is ¾ x 1½ in. Model MCT-1 has a single-hole mounting bushing and a depth behind panel of only 2½ in., including terminals.

•

Magnetic Test Set

A TEST SET for magnetic materials in laminar form is announced by General Radio Co, 275 Massachusetts Ave, Cambridge 39, Mass. It is designated as Type 1670-A. Measurements of permeability and core loss can be made at 60 cycles or at lower levels.

The sinusoidal magnetizing force applied to the test sample is said to be



adjustable from one millioersted to six oersteds. A d-c magnetizing force up to two oersteds can also be applied for incremental measurements. Permeability range is 25,000 full scale for a specimen cross section of ten sq mm.

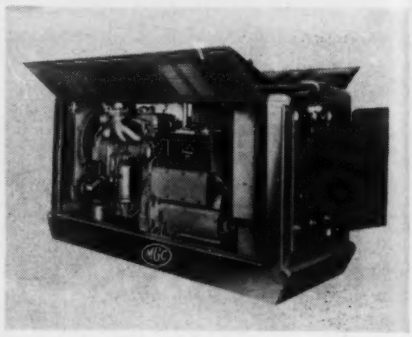
Test sample can be a single lamination or duplicate strips in parallel. Minimum sample length is 2¼ in. and maximum width is ⅜ in.

•

Engine-Driven Power Plants

MOTOR GENERATOR CORP of Troy, Ohio, has available MGC engine-generator sets which are rated single or 3-phase, 50 or 60 cycles, and from 5 to 60 kw. Each set is self-contained and equipped with controls, radiator, fuel tank and weatherproof canopy.

The units are delivered factory-assembled, ready to be put into service.



The a-c generators are of the revolving-field type with direct-connected exciter and built-in automatic voltage regulators which are said to deliver terminal voltage within 3% at any load or power factor.

D-c generators are of the compound-wound interpole type and are directly connected to the engine by a flanged coupling. They are available in sizes from 5 through 60 kw. A-c or d-c generators up to 25 kw are driven by gasoline engine, whereas units with 20 through 60-kw ratings have diesel engines.

•

Outdoor Lighting Fixture

AN ALL-WEATHER fluorescent fixture, the Four-Tube, 160-w Post-Lite, has been designed by W. H. Lang Co, 61 W. Hubbard St., Chicago 10, Ill.

This fixture is available with or without brackets for installation on posts and on walls or corners of buildings. The round globes are said to diffuse glareless light of approximately 9,200 lumens in all directions. A new catalog illustrating this and other Post-Lite models is also available.

•

Power Circuit Reclosers

DESIGNED for 6.9 to 15-kv service, the Type MBH automatic circuit recloser, announced by Railway and Industrial Engineering Co of Greensburg, Pa., is to be used for the protection of distribution circuits.

The high capacity of this device permits its use as a substation breaker to provide the same protection as reclosing circuit breaker installations. Initial trip occurs in 1½ cycles, followed by one or

UNSUNG HEROES OF POLE LINE CONSTRUCTION

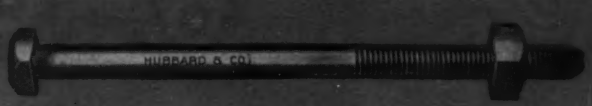
Simple things- CROSS ARM BRACES, just a strip of flat steel with a hole punched in each end, but most important to a pole line. Hubbard Braces are fabricated from the best, new, open-hearth steel and all corners are rounded to protect linemen from sharp projections. For the engineer who wishes additional strength on the compression side of the arm, the ribbed brace is provided and offers approximately 25% added protection.

HUBBARD FLAT AND RIBBED CROSS ARM BRACES

HUBBARD ANGLE CROSS ARM BRACES, for heavy construction, are supplied in a range of spreads and drops to meet the requirements of any standard construction. Angle size runs from 1½ to 2-inches. At the pole attachment hole, the angle is so formed that wrench clearance is provided. Attachment is by ⅝-inch Machine Bolt at the pole and ½-inch Carriage Bolts at the arm.

HUBBARD ANGLE CROSS ARM BRACE

DRIVE POINT MACHINE OR CROSS ARM BOLTS are roll-threaded to provide a "finger-fit" for the full length of the thread. The "Drive Point" feature enables the bolt to be used as a drift pin for the alignment of holes slightly off center. This operation must be carried out with caution so as not to injure the threads. "Drive Point" also facilitates the application of nuts and allows bolts to be driven out of the pole for reclamation without injury to the threaded end. The major portion of Hubbard bolts of all types have this feature.



HUBBARD DRIVE-POINT CROSS ARM OR MACHINE BOLT

HUBEYE BOLTS are furnished for attachments of any kind where a thimble would normally be used. The eye of the bolt is drop-forged to a shape which provides a perfect "built in" thimble. Strand may be looped around the Hubeye with complete protection. Side walls of the eye retain the roundness of the strand. There is no possibility of kinks or strains at the loop. Hubeyes are a thoroughly tried and proven product.

HUBEYE DRIVE-POINT BOLT

STANDARD HUBBARD OVAL-EYE BOLTS are an old line item still much used in many sections. Hubbard Eye Bolts are all drop-forged with an eye that is stronger than the shaft of the bolt. Made from the best, new, open-hearth steel and Hubbard Double-Dip Hot Galvanized.

HUBBARD OVAL-EYE DRIVE-POINT BOLT

HUBBARD AND COMPANY

PITTSBURGH CHICAGO OAKLAND CALIF.

For poles with PERMANENCE

SPECIFY KOPPERS!

Utility companies are extremely careful when it comes to pole installations. Understandably so, because continuity of company service—as well as operating profits—is vitally affected by the longevity of the poles selected.

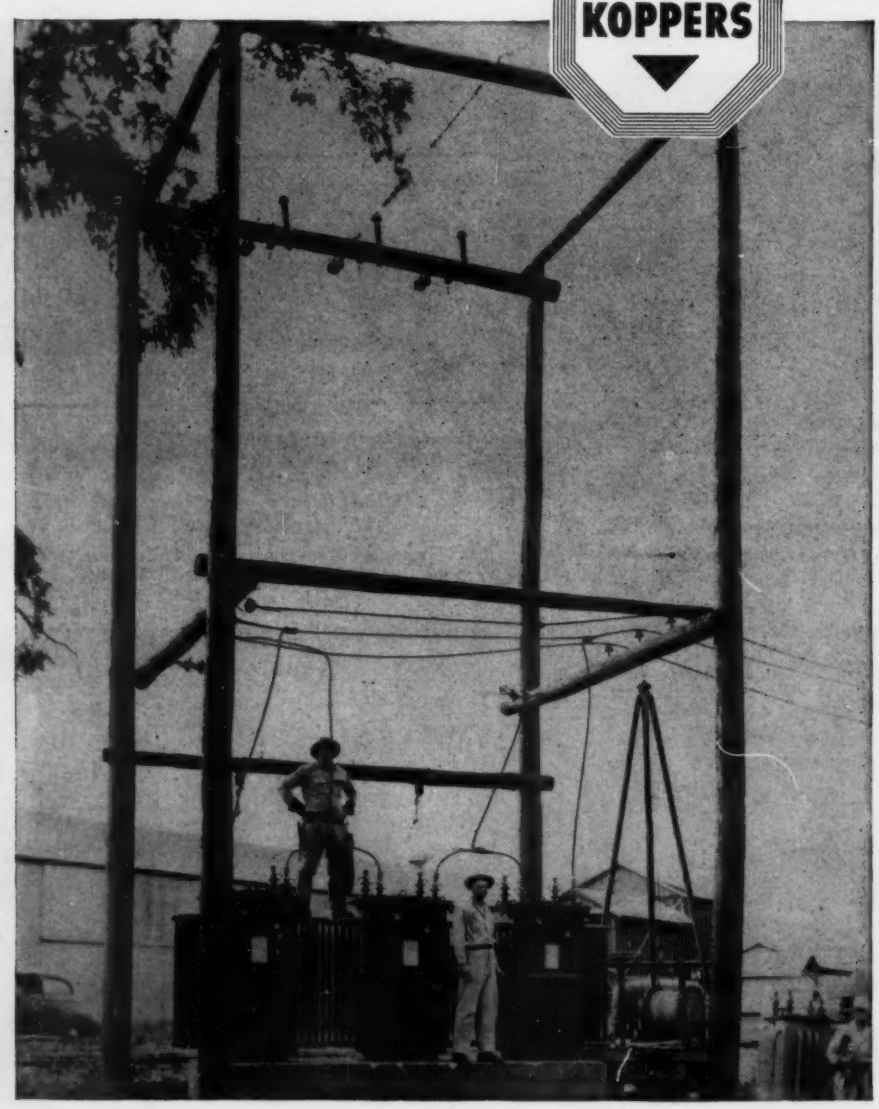
And that's why so many companies choose Koppers!

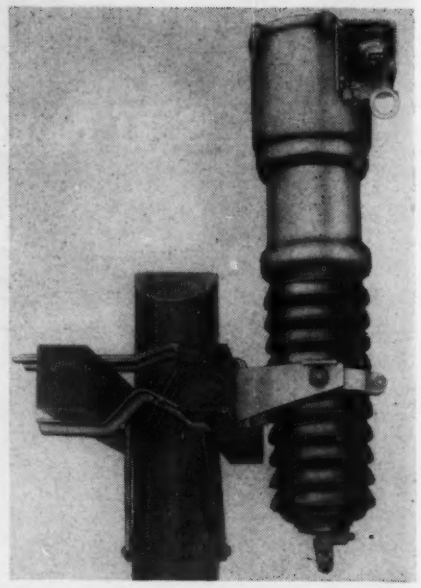
Koppers Full-Length Pressure-Creosoted Poles are built to last. They have an average life span of over 30 years. These durable, long-lasting poles are the logical answer to rising maintenance costs—to high replacement costs. Deliveries are made promptly from conveniently located treating plants.

PRESSURE-CREOSOTED WOOD

KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.

KOPPERS





more time delay trips if trouble is not cleared.

Further details of Type MBH reclosers are contained in Bulletin 1371.

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Control Station

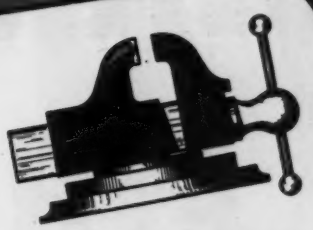
A SHIPPER-ROD operated control station, Class 9002 Type K, has been announced by the Square D Co, Industrial Controller Division, 4041 N. Richards St, Milwaukee 12, Wis.

Right or left hand operation, in either clockwise or counter-clockwise direction, is available in one device. A

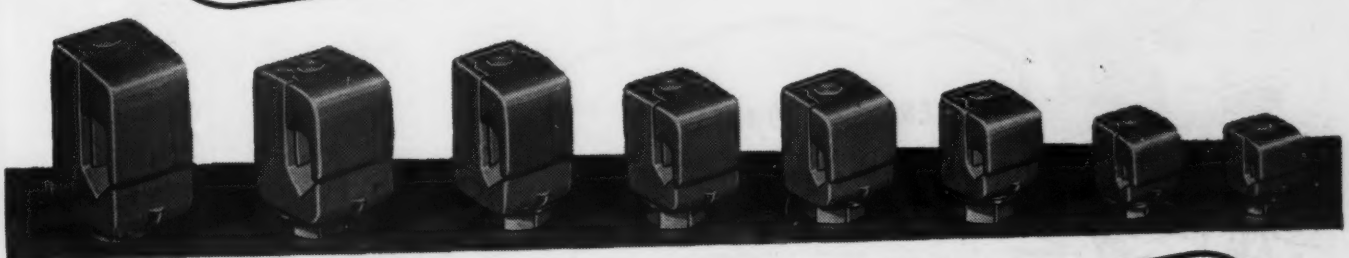
slotted operating arm can be adjusted to any angular position on the shaft to provide proper linkage adjustment. Positive contact action is assured by use of two precision snap-switch mechanisms enclosed in non-carbon tracking melamine cases. Contacts are double break, silver-to-silver, and non-overlapping. The manufacturer advises that contact mechanisms can be removed using only a screw driver.

FARGO "ONE PIECE" CONNECTORS

Built LIKE A *Vise*
Grip LIKE A *Vise*
Easy TO USE AS A *Vise*



Available in sizes from #8 to 1,000,000 CM. Two sizes of bolt heads (3/4" and 7/8") fit the range from #8 to 4/0, the sizes most commonly used by linemen.



"*Easy-to-use*" TOOLS, TOO!

Although any open end, adjustable or socket wrench will do . . . each of the following styles will fit the eight sizes (#8 to 4/0) linemen use most frequently. They are handy, speedy . . . and fit a number of other applications, too.

GP 200

A standard socket with one size on each side of the head.

GP 201

A flat ratchet with box type sockets on each end.

GP 202

The GP 200 with a molded handle which offers a better grip and insulates the handle.

Distributed by
LINE MATERIAL COMPANY
Milwaukee, Wisconsin

FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Port Washington, N. Y.

LM

BERMICO* FIBRE CONDUIT

BERMICO CONDUIT IS REALLY RUGGED—IT'S BUILT TO TAKE ROUGH HANDLING ON THE JOB.
ITS CLEAN, SMOOTH BORE MAKES PULLING CABLES THROUGH BERMICO FIBRE CONDUIT QUICK AND EASY.

distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

Enclosures are die cast zinc alloy, with conduit entrances at each end, and are available in NEMA Type I general purpose or NEMA Type IV watertight construction.

•

Battery Charger

EQUIPPED with a control panel set at desk-top level, the Charg-O-Matic is an automatic, single-circuit, motor-generator battery charger and is manufactured by The Hertner Electric Co, 12690 Elmwood Ave, Cleveland, Ohio.

All electrical connections, relays, motor-generator set and other working parts are housed inside a metal cabinet to prevent accidental contact with electrical equipment. A pilot lamp lights up when the set is "on charge."

The manufacturer reports that the unit will charge a lead-acid battery in 8 hr; a nickel-alkaline battery in 7 hr.

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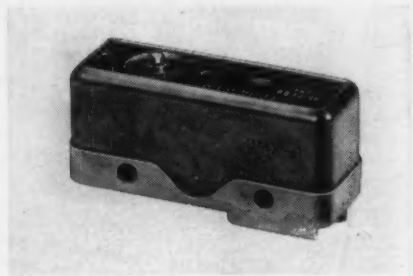


Universal Switch

DESIGNED for use interchangeably on d-c or a-c circuits, the Unimax Model DMX has single-pole, single-throw silver contacts capable of handling 10 amp at 125 v. Announcement of the unit came from the Unimax Switch Division of the W. L. Maxson Corp, 460 W. 34th St, New York 1, N. Y.

The following structural features are said to provide the high d-c handling

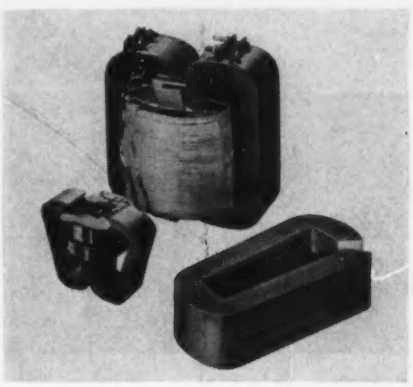
capacity of the Model DMX switch: A focussed-flux Alnico magnet blows out the destructive arc when contacts open; a ceramic baffle chamber keeps the arc from reaching the contact supporting screws; and arc-resistant melamine is used for molding the base and cover.

The housing is 1 1/8 in. long, 1/2 in. wide, and 61/64 in. high. To permit varied methods of applying operating force, the switch may be used with Unimax Adaptaplates.

•

Wound Core Transformer

HAVING a core loss said to be 25% less than that of equivalent sheared or laminated cores, the Elcor Wound Transformer Core Structure can be used with radio transmitters, and in power distribution, neon signs and rectifiers. This flexible core is made by Elcor, Inc, Butler, Wis.



Reduced watt-loss is credited to annealing and the preference magnetic flux has for the direction in which steel was rolled. The single cut in the core structure saves assembly time and permits easy installation, replacement, or repair of various coil sizes.

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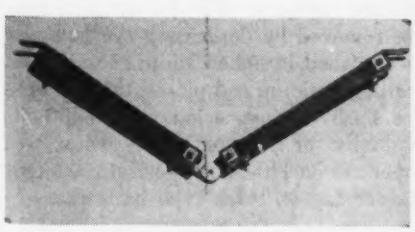

Crossarm Braces

LOCKE INC, Box 57, Baltimore 3, Md., has recently announced wooden crossarm braces used to support wooden crossarms.

The wood member of the crossarm brace, furnished in a standard 1 5/8 x 2 5/8 in. finished cross section, is select dense West Coast fir. When desired, it is furnished creosote treated. It is claimed that because of the large wood cross-section, either of the two wood braces can prevent unbalancing of the crossarm, should one become damaged.

All metal fittings on the wood crossarm are made of No. 9 gauge steel and are galvanized by Locke's double dip perma-zinc method.

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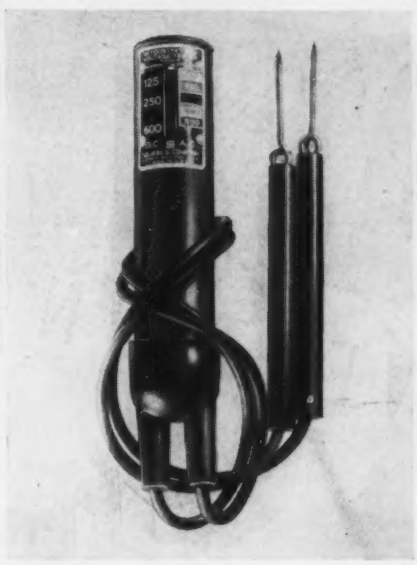


Voltage Testers

SQUARE D CO, 6060 Rivard St, Detroit 11, Mich., has available two voltage testers which operate without the use of indicating lamps.

The alternating system tester measures 110-550 v at 400 cycles or d-c voltages of 30-120 v. The low voltage tester measures 12-60 v at 60 cycles or d-c voltages of 10-40 v.

Included with the testers are rubber protected test leads, fiber tester body and sharp spear points for piercing insulation without damaging it.

•

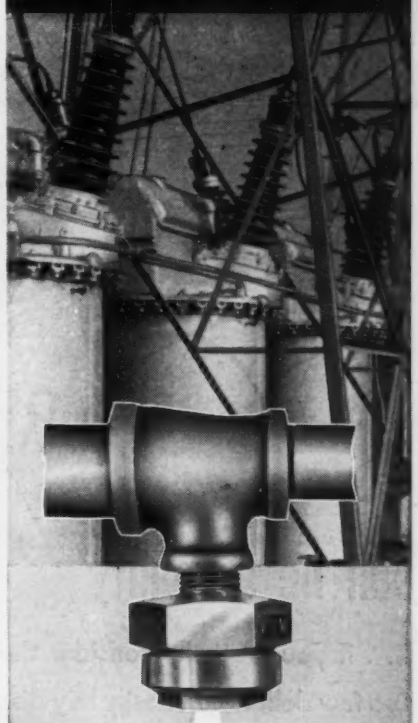
Charge Indicator

TO PREVENT battery operation in an over-discharged condition, the Gould Storage Battery Corp, Trenton 7, N. J. has designed a charge indicator which gives the momentary charge condition of the battery, and thus keeps the operator informed as to its state-of-charge.

The dashboard-mounted indicator is marked off into four sections, each of a different color. Green indicates a one-half to full charge, yellow a one-quarter to one-half charge, red a zero to one-quarter charge and pink indicates that the battery is being used in an over-discharged condition. An aluminum case, designed especially for vertical mounting, houses the instrument.

The Wheatstone Bridge type instrument can be used with 3, 6, 12, 15, 16, 18 and 24-cell batteries, a series

BLAW-KNOX
FOG NOZZLES
INSURE AGAINST MORE THAN FIRE ALONE

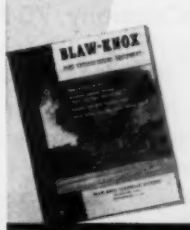


Those big "pots" in a transformer bank hold a lot of oil, wire and other valuables that fire can destroy.

But they also hold greater treasures in *un*-interrupted power service, *un*-broken production lines in mill and factory and un-disturbed public relationships.

Blaw-Knox Fog Nozzles and Electrically Controlled Automatic Fire Protection Systems insure you against far-reaching losses that hurt more than the loss of the physical property involved in a fire.

Blaw-Knox Fire Protection Equipment is listed by Underwriters Laboratories, Inc., and approved by Factory Mutual Laboratories.



SEND for Blaw-Knox Bulletin No. 2207

BLAW-KNOX
SPRINKLER DIVISION
of Blaw-Knox Construction Company
829 Beaver Ave., N. S.,
Pittsburgh 12, Pa.
Offices in Principal Cities

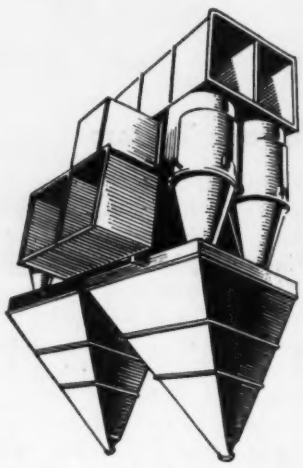
PRACTICAL

fly-ash

PREVENTION

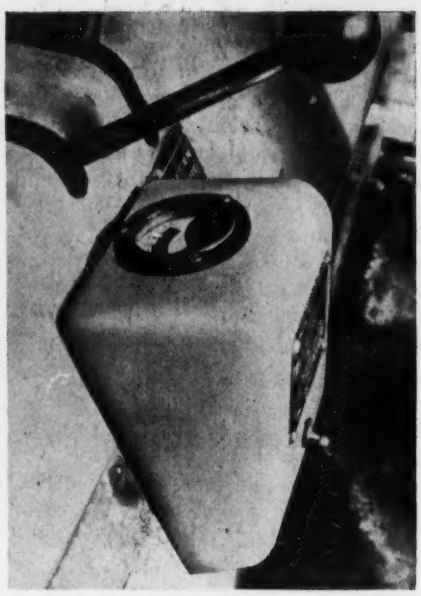
can be a reality

. . . if you logically consider the problem. Too few dollars can easily buy disappointing efficiency while it is just as possible to over-invest with the same result. That's where the Buell van Tongeren Cyclone comes in. With a patented "Shave-Off" to overcome the "double eddy" evil, it can be big enough to overcome plugging hazards. Individually engineered for each specific application Buell is in a class apart in achieving high fractional efficiencies. There's convincing data in the 1948 Buell catalog. Write to: Buell Engineering Company, 70 Pine Street, Suite 4900, New York 5, N. Y.



buell

Engineered Efficiency in DUST COLLECTION



of resistors and taps providing the desired adjustment. A toggle switch disconnects the instrument from the battery during charge.

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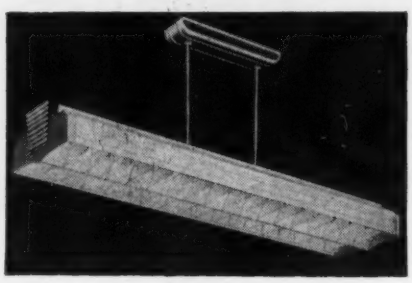


All-Metal Lighting Unit

A LIGHTING UNIT, of metal construction throughout, has been designed for classrooms and libraries by Mitchell Mfg Co, 2525 Clyborn Ave, Chicago 14, Ill. It is called Model 3031.

The fixture embodies a locking and hanging principle whereby the louver is released to a hanging position on two slotted hangers. The louver then may be removed by depressing the hangers.

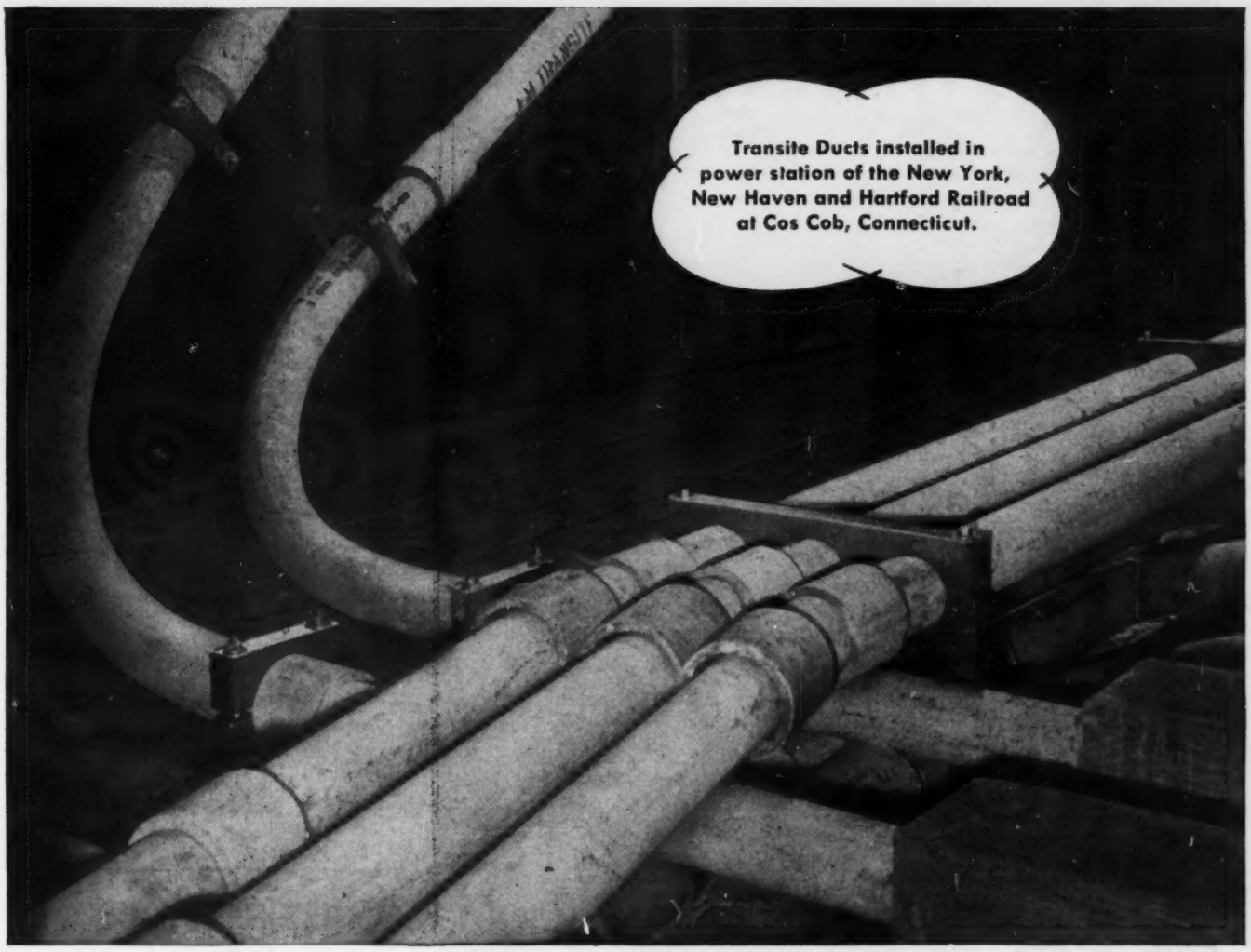
Finished in baked white enamel with satin-aluminum end pieces, the unit may be flush or suspension mounted, individually or in continuous rows. It operates on 110–125 v a-c and uses high power factor, brick type ballasts.

•

Microfilm Camera

DEVELOPED to continuously photograph large copy up to 42-in. wide and of any length, the No. 90-05 Flofilm microfilm camera is available from Diebold Inc, Flofilm Division, Diebolt-Pratt & Gray Laboratories, Westport Ave, Norwalk, Conn.

The camera, according to its designers, can photograph over one-half mile



These Transite Ducts safeguard Cos Cob's Power Lines

Transite* Ducts were chosen for the important job of protecting the power lines in the New Haven's Central Power Station at Cos Cob because they meet every requirement of a low-cost efficient cableway system.

These asbestos-cement ducts provide 5 major advantages:

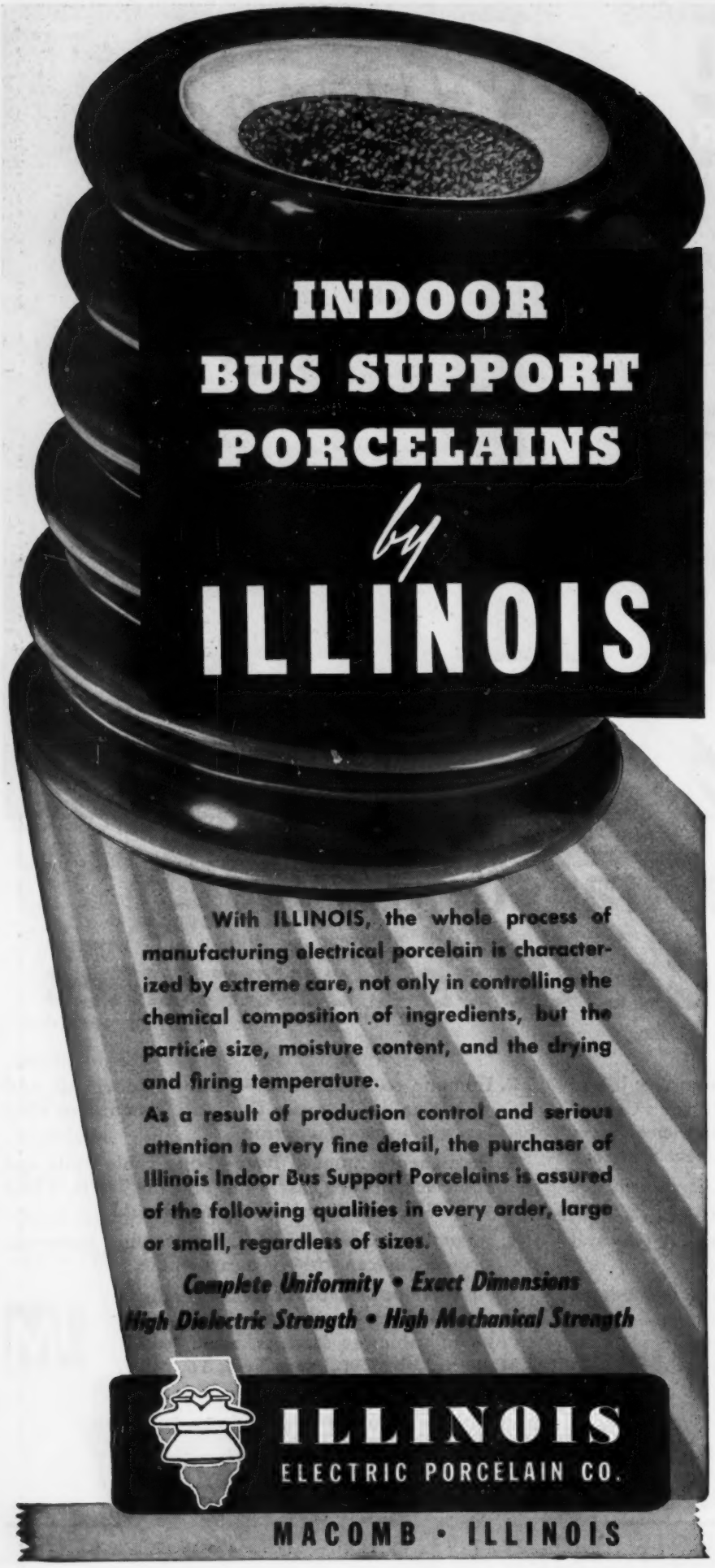
1. Easy to Install—Transite Ducts are light in weight and come in long 10-foot lengths that are easy and economical to assemble and install.
2. Strong, Corrosion-Resistant—Transite is made of asbestos and cement combined under great pressure into a permanently strong structure. These ducts are practically unaffected by corrosive soils.
3. Immune to Electrolysis—Entirely inorganic and non-metallic, Transite Ducts are immune to electrolytic or galvanic action.
4. Permanently Smooth Bore—Long cable pulls and replacements are easy with Transite Ducts. Their smooth bore minimizes damage to cables.
5. Incombustible—Transite Ducts confine burnouts, protect adjacent cables in case of fire.

Reg. U. S. Pat. Off.

For further information on how Transite Ducts can increase the safety and cut the costs of cableway systems, write Johns-Manville, Box 290, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS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BUS SUPPORT
PORCELAINS
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ILLINOIS
With ILLINOIS, the whole process of manufacturing electrical porcelain is characterized by extreme care, not only in controlling the chemical composition of ingredients, but the particle size, moisture content, and the drying and firing temperature.
As a result of production control and serious attention to every fine detail, the purchaser of Illinois Indoor Bus Support Porcelains is assured of the following qualities in every order, large or small, regardless of sizes.
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of copy on a 100-ft roll of 35mm film. Reduction ratios up to a maximum of 34 times, which reduces the image to less than 1/1000 original size, are made possible by passing copy over the lens of an inverted camera. Fed in much the same manner as a blueprint printer, the unit can photograph copy at speeds of either 30 or 60 fpm.

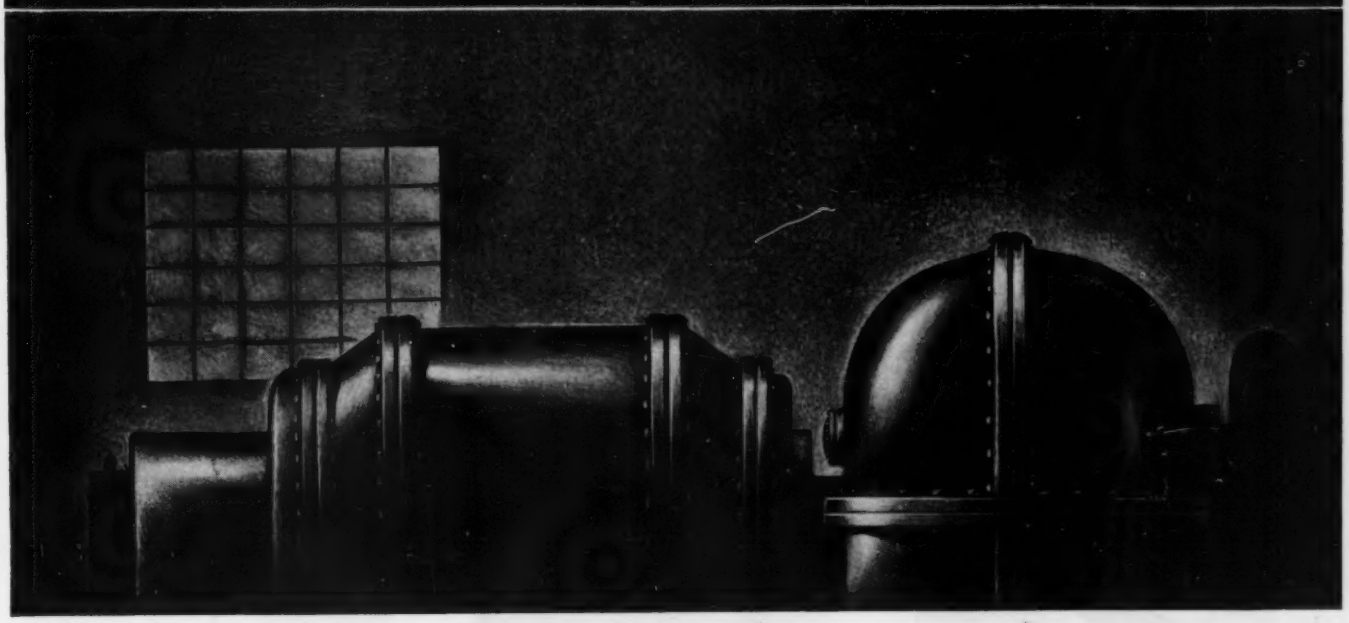
Also serving as a printer and enlarger, this camera finds application in the micro-reproduction of large drawings, blueprints, maps and surveys. The unit is 52-in. wide, 41-in. high and 20-in. deep with feed shelf 32 in. above the floor.

MORE NEW PRODUCTS
about which you should know

Stanley Electric Tools, New Britain, Conn., announced the No. 218 **metal shear** which weighs only 4¾ lb and can be adapted to various voltages including 115 v. . . . Photovolt Corp, 95 Madison Ave, New York 16, N. Y., has a **photoelectric instrument,** Model 205, for measuring the brightness of television tubes, screens and cathode ray tubes. . . . Gits Molding Corp, 4600 W. Huron St, Chicago 44, Ill., introduced a flashlight-type No. 788 **traffic flare** that has a rubber suction cup on the end of the case for attachment to vehicles.

Interstate Mfg Corp, 138 Sussex Ave, Newark, N. J. can furnish electrical **wiring harnesses** in either rigid or flexible, steel clad conduits and fittings attached. . . . Rockwood Sprinkler Co, 38 Harlow St, Worcester 5, Mass, has a **fire extinguisher** of a liquid type for producing FOAM and Fog FOAM by use of an Eductor for proportioning the liquid and water. . . . Pell Cable Cutter Co, 55 New Montgomery St, San Francisco 5, Calif, announces a manually operated **cutter,** the Hydrashear, with a capacity up to 1½-in. wire rope or cable.

WHEN YOU FIRE-PROTECT
LARGE ROTATING MACHINERY



remember: **from Boston to Los Angeles—from Hudson Bay to Uruguay—from England to China—generators, synchronous condensers and frequency changers in more than 500 major power plants are safeguarded by *Kidde** Carbon Dioxide (CO_2) Systems.**

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NEWS ABOUT PEOPLE

Hennek Elected Executive V-P of Kansas Utility

E. P. Hennek, formerly general superintendent of the Central Electric & Gas Co, Lincoln, Neb., has been

E. P. HENNEK

appointed executive vice-president of the Western Light & Telephone Co, Kansas City, Kan. Mr Hennek has a broad background of experience in the utility industry. Starting with the Iowa-Nebraska Light & Power Co in 1928, for several years he was engaged in power plant construction work. In 1931 he was appointed Seward district superintendent and in 1932 industrial engineer with headquarters at Lincoln, Neb.

After serving a term as Lincoln district superintendent, he was promoted to the position of general superintendent for the Iowa-Nebraska Light & Power Co in 1944 and assumed that same title for the Central Electric & Gas Co after its acquisition of the Iowa-Nebraska properties.

•

▶ GEORGE P. PAINE has been appointed director of promotion of the American Standards Association. He will continue to act as executive assistant to Howard Coonley, chairman of ASA's executive committee. Mr Paine has been connected with the John Price Jones Corp of New York and was on the staff of the National Association of Manufacturers before the war.

▶ DON B. POTTER, manager of the Clarksburg division of the Monongahela Power Co, Fairmont, W. Va., has been appointed manager of the company's new business department. He succeeds the late Charles E. Snyder. Although Mr Potter started with Monongahela in Clarksburg in 1929, returning to Fairmont will not be a new experience for him, because in his almost 20 years with the company, he has had four Fairmont area assignments.

•

G. S. Young to Direct Power and Lighting Sales

Glenn S. Young, formerly manager of power sales for Kansas City Power & Light Co, Kansas City, Mo., has been

G. S. YOUNG

named manager of the power and lighting sales department of that company. The department which Mr Young now heads is a new unit resulting from the combination of the power sales and the commercial lighting sales departments of the Kansas City utility. The merging is a move for greater company efficiency and economy.

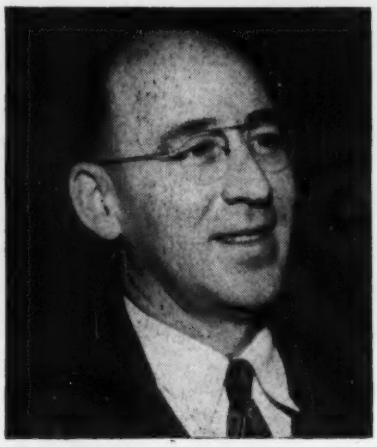
Mr Young has been connected with Kansas City Power & Light since 1926, and he has been in the power selling business all but the first six months of that period. He started with Kansas City Power & Light immediately after graduation from the University of Missouri.

•

▶ WILLIAM M. MURRAY, JR, has been named permanent director of the Southern Research Institute, Birmingham, Ala. Dr Murray has been serving as acting director since the retirement last March of Dr Wilbur A. Lazier.

Reading Utility Appoints Deck System Engineer

A. R. Deck, formerly chief system operator for the Metropolitan Edison Co, Reading, Pa., has been appointed



A. R. DECK

to a new position, system engineer. Principal duties of Mr Deck are to make studies of system requirements and changes necessary to meet the load growth on the Metropolitan system as well as changes and additions which may be required through relations with interconnected systems.

Mr Deck brings to his new position 25 years, experience in the electric utility field, all of which has been spent with Metropolitan Edison and its affiliate, the New Jersey Power & Light Co, Dover, N. J.

•

▶ CHARLES W. MCCORMICK has been appointed supervisor of commercial lighting for the Connecticut Light & Power Co. He will be responsible for the coordination of all commercial sales and lighting activities on the system. His headquarters will be at Waterbury, and he will report to P. V. Hayden, industrial manager. Mr McCormick joined the company in 1946 as an illuminating engineer.

▶ LEEDS A. WHEELER has been named general counsel for the New England Electric System, succeeding Judge F. J. Dunn. Mr Wheeler joined the system in 1934 as attorney for the New England Power Engineering & Service Corp. In 1941 he was elected vice-president of

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● To the utilities and their equipment manufacturers, Ryerson has meant prompt, efficient steel service for more than a century. Soundly experienced in the handling of every power generator requirement, Ryerson specialists are always ready to work with you on any steel problem, whether it is calculated in pounds or tons.

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the New England Power Service Corp. Mr Wheeler is also a member of the Wellesley, Mass., Municipal Light Commission.

•

Folsom New RCA President Wilson Heads Victor Unit

Frank M. Folsom has been elected president of the Radio Corp of America, effective Jan 1, and John G. Wilson, vice-president and general manager in Camden, has been elected executive vice-president in charge of the RCA Victor Division.

Mr Folsom, executive vice-president in charge of RCA Victor Division, has administered the far-flung production and merchandising activities of RCA for the past five years. It is to the position formerly occupied by Mr Folsom that Mr Wilson succeeds.

•

▶ ROSCOE SEYBOLD, vice-president of the Westinghouse Electric Corp, has been appointed assistant to the president with special responsibility for organizational planning and budget and operating expense control. The treasurer, controller, and the director of budgets of the company will report to Vice-President Seybold.

▶ DR KARL T. COMPTON, chairman of the National Military Research and Development Board, was honored recently by Great Britain for his contributions to the Allied war effort. British Consul General Charles Eric Whitamore, by order of King George VI, presented to Dr Compton the award of honorary commander of the civil division of the Most Excellent Order of the British Empire.

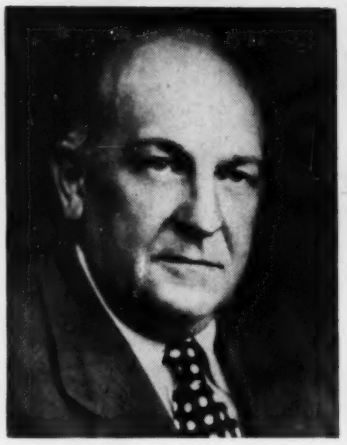
▶ NICHOLAS F. ARONE and EDWIN H. BRINK, of the switchgear divisions laboratory of the General Electric Co at Philadelphia, have been named as co-recipients of a 1948 Longstreth Medal of the Franklin Institute. The award will be given to Arone and Brink for their development of phospho-asbestos, an inorganic thermo-setting compound. This new material has contributed in a major way to the creation of a greatly improved interrupter for power circuit breakers operating in air.

▶ STUART L. BAILEY, a consulting radio engineer and partner of the firm of Jansky and Bailey, Washington, D. C., has been elected president of the Institute of Radio Engineers. Mr Bailey has been active in IRE committee work for a number of years and has been a fellow since 1943.

G. U. Parks Given Broader Engineering Assignment

Announcement has been made of the appointment of George U. Parks as assistant superintendent of production, steam stations, Boston Edison Co.

For 24 years Mr Parks has been general manager of the Montaup Electric Co, Fall River, Mass. From 1919 to 1924 he served as a consulting engineer on electrical construction and appraisals. When the Stone & Webster organization planned the construction of the Montaup plant on the Taunton River in Somerset, Mr Parks became the first employee of the new Montaup Electric Co in 1924.



G. U. PARKS

▶ BENJAMIN S. MURPHY, assistant manager of the electric production department, Consolidated Edison Co of New York, Inc, has retired. Mr Murphy had been identified with Consolidated Edison and its predecessor New York Edison Co since 1907, when he became a mechanical inspector in the Hudson & Manhattan Railroad Co. He was made superintendent of the Jersey City generating station in 1920 and in 1926 was transferred to the East River generating station as chief engineer. In 1937 he was assigned to the Hudson Avenue generating station as chief engineer. He was made assistant manager of the electric production department in 1944.

▶ MARSHALL G. MUNCE has been elected a vice-president of the York Corp, York, Pa. Mr Munce's major assignment in his new capacity will be that of representing top management in assisting the sales organization through trade relations and public relations activities. Joining the York organization in 1921, Mr Munce served for 5 years (1932-37) as manager of its Washington sales office, following which he took an emergency assignment as managing director of the corporation's British subsidiary, York Shipley Limited, London, England. Since returning to York in 1940, he has been assistant to the president, chiefly as coordinator between engineering, manufacturing, and sales divisions. These activities were recently taken over by J. KEITH LOUDEN, formerly with the Armstrong Cork Co, Lancaster, Pa.

▶ JAMES B. HAYES, manager of the Nova Scotia Light & Power Co and subsidiaries since 1929, has resigned because of ill health. CECIL J. HAYES, who has been secretary of the parent company for the past 25 years, has been named acting manager in addition to secretary. C. J. Hayes has been associated with the Nova Scotia properties for the past 30 years.

▶ ALLYN E. HARPER has been appointed chief plant engineer of the Oliver Iron & Steel Corp, Pittsburgh. Mr Harper was formerly plant engineer of General Cable Corp in St. Louis, Mo. His first connection was with L. Eugene Robinson as a designer of industrial plants. Later he was engaged in various engineering capacities with Allis-Chalmers and Central Illinois Public Service Co and was vice-president and chief engineer of the Coal Carbonizing Co, St. Louis. More recently he was general superintendent of the F. H. McGraw Co.

▶ G. H. GROSSNICKLE has been appointed manager of the meter division of the Westinghouse Electric Corp, Newark, N. J. Mr. Grossnickle joined Westinghouse in 1923, transferred to the meter division in Newark in 1925, and in 1939 was appointed manager of manufacturing.

▶ R. R. DONALDSON has been named vice-president in charge of engineering of the Hagan Corp and M. J. Boho has been elected vice-president in charge of sales. Joining the organization in 1918, Mr Donaldson rose through the ranks and became chief engineer last year. Mr Boho joined Hagan in 1936, after serving as a research engineer in private industry and with the Potomac Electric Power Co, Washington, D. C. In 1945 he was appointed assistant general manager of sales.

▶ BYRON H. CUTLER, formerly chief engineer of the L. E. Meyers Co, Chicago, is now vice-president of Muncie Construction Corp, Muncie, Ind. Earlier in his career, Mr Cutler had been employed by the Public Service Co of Northern Illinois and Commonwealth &

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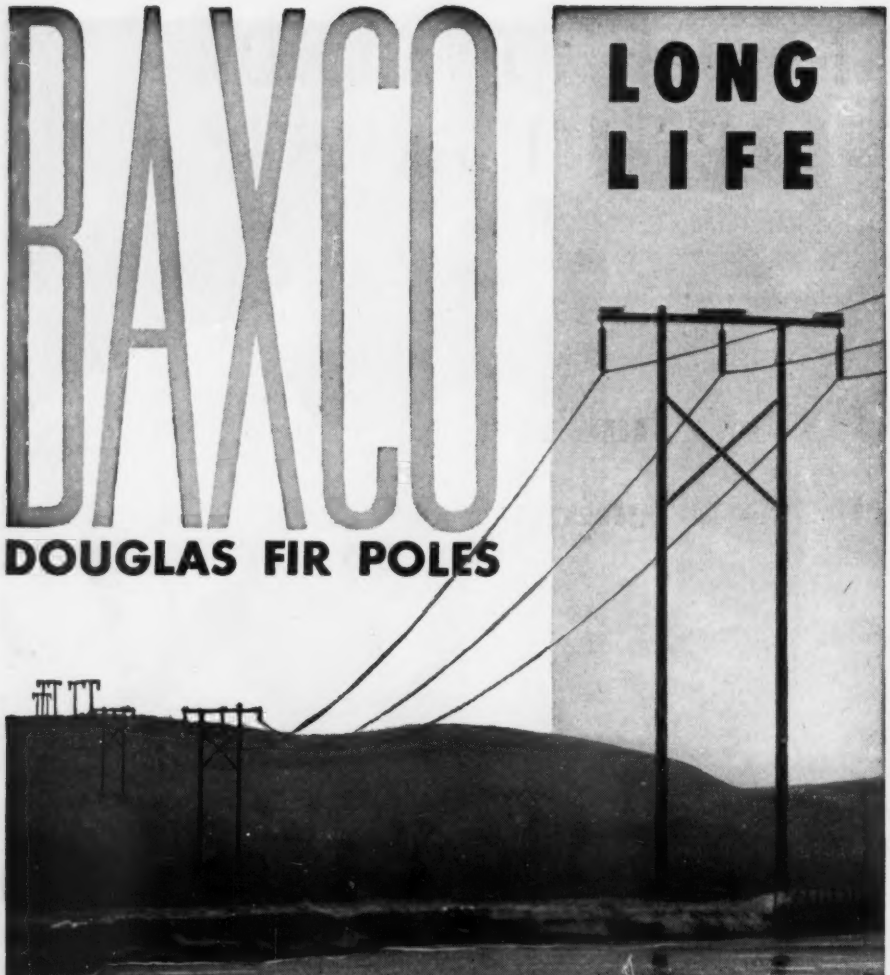
LONG LIFE

DOUGLAS FIR POLES



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BAXCO Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut your maintenance costs and yield longer and more satisfactory service.

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Southern Corp on transmission line design. He had also served as construction superintendent for electrical contractors.

•

Ebasco Appoints Acting Manager in Washington

Walter B. Cosdon has been named acting manager of the Washington office of Ebasco Services, Inc. He has been a

W. B. COSDON

member of Ebasco's Washington staff since 1944.

Mr Cosdon joined the survey department of the Potomac Electric Power Co in 1937. He became a member of the power branch of the War Production Board in 1942, transferring to the Office of War Utilities when it was established later. He was assistant administrator of Order U-1 when he left OWU to go with Ebasco.

▶ Arthur A. Brainerd, illuminating engineer for the Philadelphia Electric Co, has been elected president of the U. S. National Committee of the International Commission on Illumination. Mr Brainerd started with the Philadelphia utility in 1924 and was appointed illuminating engineer in 1946. Recently he has devoted himself largely to special lighting developments and professional association committee activities. Mr. Brainerd has been active in the Illuminating Engineering Society and for the past ten years has been executive secretary of the U. S. National Committee, ICI.

▶ Dr Kenneth S. Pitzer, professor of chemistry at the University of California, has been appointed research director for the Atomic Energy Commission. A member of the California faculty since 1937, Dr Pitzer obtained leave of absence from the university to serve as chief of AEC's research division. The position has been vacant since August, when Dr James B. Fisk

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Elkonite metal proved so dependable under the most severe conditions that it quickly became standard on most heavy duty circuit interrupting equipment. It also proved indispensable in the field of resistance welding and in countless applications requiring its particular characteristics.

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quit the commission to become professor of applied physics at Harvard University. Dr Pitzer's duties will include direction of the commission's research in the physical sciences and supervision of isotope production and distribution.

•

Seattle City Light Names Assistant Superintendents

John M. Nelson and Ira L. Cottom have been appointed assistant superintendents by Seattle City Light.

Mr Nelson has been with the department for 12 years, rising from an operator's helper to senior electrical engineer. Mr Cottom was in the abstract division of the city engineering department before joining City Light in 1943 as right-of-way and property agent.

This will be the first time City Light has had two assistant superintendents. There previously had been one assistant superintendent, but the position had been unfilled since the recent death of Wilber Snow.

•

▶ M. F. Beisber has been appointed assistant vice-president of the Line Material Co, Milwaukee. Mr Beisber joined Line Material in 1933 and was assigned to Knoxville, Tenn., the following year as a sales engineer. Later that same year he was made district manager with offices in Memphis. In 1941 he was transferred to California as transformer specialist for the West Coast and in 1945 moved to the Zanesville, Ohio, plant to become sales manager of the transformer division.

▶ R. H. Harper has joined the sales staff of the W. N. Matthews Corp, St. Louis, Mo. Mr Harper will act as assistant to Rives Matthews, vice-president in charge of sales. Mr Harper was associated with the Union Electric Co of Missouri for a number of years in the purchasing of electrical equipment.

OBITUARY

Bennett M. Leece

Bennett M. Leece, co-founder and president of the Leece-Neville Co, Cleveland, died at his Shaker Heights home on Dec 5. He was 72 years old. A self-taught engineer, Mr Leece, with the late Sylvester M. Neville, organized the company, which he has headed since its formation in 1909.

•

▶ Frank H. Stewart, one of the founders of the Electrical Association of Philadelphia and its president in 1919, died on Oct 14 in Camden, N. J.,

at the age of 75. Mr Stewart entered the electrical industry in 1894 and in 1896 founded the firm bearing his name. He retired in 1928.

•

Albert A. Pope

Albert A. Pope, a pioneer in the electric utility field in New York, died on Dec 7 at his home in Westfield, N. J. He was 81 years old.

Beginning with the Edison Electric Illuminating Co of Brooklyn in 1889, he transferred to the New York Edison Co the following year. He was one of the four men who organized what is now the sales department of the Consolidated Edison Co of New York, Inc. Mr Pope retired as assistant general commercial manager of the New York Edison in 1929 after nearly 40 years with the company, but carried on his work for the Edison Savings and Loan Association, until 1942.

Over a long period he was prominently connected with the company's joint work with the New York Board of Fire Underwriters and represented the company on committees working on the National Electric Code and on insurance matters involving wiring.

Active in committee work for the National Fire Protection Association and the New York Electrical Society, he was also a charter member of the IES and a member of the old NELA.

•

Albert B. Tenney

Albert B. Tenney, 75, retired utility executive, died at Lexington, Mass., on Dec 5. For many years he was identified with companies then managed by Charles H. Tenney & Co in New England as vice-president or director.

Mr Tenney was a graduate of the Massachusetts Institute of Technology. In association with his brother, Col. Charles H. Tenney, he participated actively in the development of various properties north and west of the Boston area, and particularly in their unification in the North Shore district before their acquisition by the now New England Electric System.

•

► Benedict J. Baker, 63, until last summer chairman of the Gamewell Co, Boston, died in that city Nov 18. He had also been chairman of the Rockwood Sprinkler Co., Worcester.

► Bernhard Machol, owner of the General Engineering Co, died on Nov 24 at his home in Cleveland Heights, Ohio. He was 72 years old. An authority on d-c motors, Mr Machol started his company 40 years ago.

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MANUFACTURERS and MARKETS

REPRESENTATIVES of the incandescent and fluorescent lamp industry meet in Washington to determine how best to mobilize their industry in case of a national emergency. The group was formed at the request of the National Security Resources Board. Left to right are F. J. Healy, Sylvania Electric Products, Inc; D. H. Marsh, Champion Lamp Works; R. M. Dorsey and Leslie Doidge, deputy directors of NSRB's Consumers Durable Goods Division; Ben Gero, Westinghouse; M. J. Hammer, General Electric; and James Cox, Durotest Corp

Electrical Manufacturers Report Plant Lay-offs

Several electrical companies were among those manufacturers who reported recent lay-offs in their plants.

Westinghouse Electric Corp revealed that a gradual reduction in working forces at its Lima, Ohio, plant has been going on for six months. About 850 workers have been dropped during this period at this plant, which makes fractional horsepower motors. A general leveling-off in the market for small motors was responsible for the cutbacks, Westinghouse announced. Employment at the home appliance plant at Mansfield, Ohio, continues steady with about 8,000 employed.

Ohio Electric Mfg Co, Cleveland, reduced its working force 15% this month, also because of a drop in orders for small electric motors, Chester Bland, president, announced. The company's electric motor division has reduced production about 20%, Mr Bland stated, but a 5% pick-up in the lifting magnet department held the total employment decline to 35 persons, or 15% of the labor force of 250.

Apex Electrical Manufacturing Co has laid off 300 employees in its plants at Cleveland and Sandusky, Ohio, and has put the plants on a four-day week, C. G. Frantz, president, has disclosed. Each plant employs 1,500 persons. More lay-offs were in prospect at the first of the year. The cut in output and working forces came after shipments of Apex appliances dropped in October and early November by about one third from previous months this year, Mr Frantz said. He blamed the cut in shipments on the reimposition of installment regulations on Sept 20. The Federal Reserve Board order, which calls for a down payment of 20% on installment purchases of household appliances, caused a drop in sales, "although the fact that supply is catching up with demand may also be a factor."

National Carbon Co, Cleveland, recently dropped 30 employees because of a decline in orders, bringing the total cut in employment since Nov 1 to about 300.

Copeland Refrigerator Co has eliminated the night shift at its Sidney, Ohio, plant, Frank G. Gleason, vice-president, has reported. The company has cut employment from 875 to 700.

Dominion Electric Co, Mansfield, manufacturer of small home appliances, has laid off 200. Leonard B. Hurwitz, comptroller, emphasized, however, that the company will begin re-hiring on fan production in January.

•

Will Repay Half of Loan

General Electric Co will prepay $25,000,000 of its $50,000,000 indebtedness now outstanding, Charles E. Wilson, president, has announced. Payment will be made on Dec 28. The five-year loan was negotiated in 1946.

Wagner Applies Drip-Proof Design to Larger Motors

Wagner Electric Corp, which has built drip-proof motors in frames 225 and smaller for many years, has adopted the same design for its polyphase motors in the 254,284,324 and 326 frames. The motor frames of the new design are almost exactly like those of their prototypes, differing from them only in the omission of all ventilating openings. They are formed of heavy rolled steel, shaped to accurately center the stator core and to provide passages between the frame and the core for ventilation. An auxiliary fan, larger in diameter than the armature of the motor, draws in air through the openings in the front endplate.

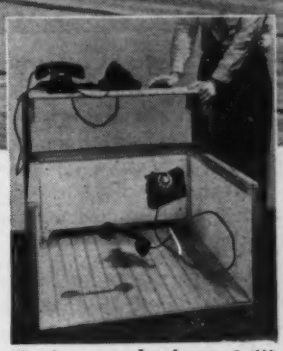
Screens on the end plant openings prevent articles from being drawn into the motor.

They are available with both sleeve bearings and ball bearings.

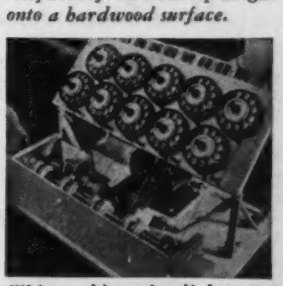
•

L-M Expands Facilities

Line Material Co, Milwaukee, has acquired a large, modern plant to replace its present manufacturing facilities in Birmingham, Ala. The new buildings occupy 165,000 sq ft, which is more than four times as large as the old plant, and provide ample space for expanded production and the addition of a regional warehouse. A completely



Not just once, but from 16 different positions, we drop sample telephones from desk-top height onto a hardwood surface.



This machine spins dials 40,000 times a day—day after day—to make them prove they're good for at least 500,000 twirls.

We expected this . . .

YOUR TELEPHONE must take hard knocks as they come—and go on working.

To make sure it can, we test samples of each day's production and put telephones through the equivalent of years of service in a few hours or days. For example: we drop handsets into their cradles 22,000 times—equal to 4 years' normal use. We even check their feet to be certain they won't scratch your table.

Here at Western Electric, we've been making Bell telephones since 1882. But telephones themselves are only about 6% of the equipment used in your service.

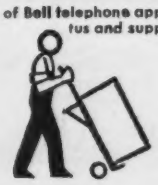
The other 94% includes wire, cable, switchboards, trucks, poles, crossarms, tools, office equipment. With the exception of buildings, we make or supply almost everything Bell telephone people use—and test it with utmost care.

Guarding the quality of things used in your Bell telephone service is one way that Western Electric helps to make it the world's best.

MANUFACTURER of telephone apparatus for the Bell System.

PURCHASER of supplies for Bell Telephone companies.

DISTRIBUTOR of Bell telephone apparatus and supplies.



INSTALLER of Bell System central office equipment.

Western Electric

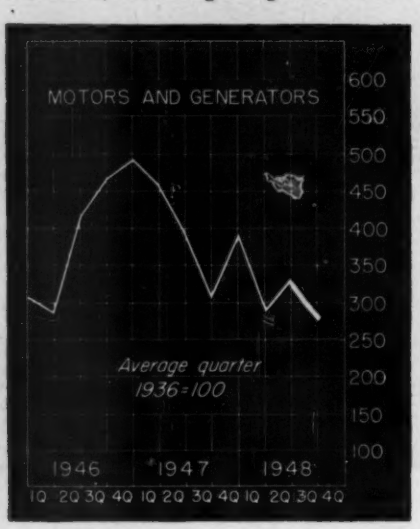
A UNIT OF THE BELL SYSTEM SINCE 1882

equipped transformer repair shop will be maintained in these quarters. The acquisition of this new plant is a step in L-M's expansion program. The company has just opened a new warehouse at 2700 Paxton St, Harrisburg, Pa.

•

Generator Orders Drop 14% in 3rd Quarter

Orders received for motors and generators during the third quarter of 1948 decreased, according to figures released



by the National Electrical Manufacturers Association. The index compiled by NEMA moved downward to 282 from 329 in the second quarter, a drop of 14%.

In 1947 the index stood at 308 for the third quarter, this year's figure representing a decrease of 8%.

No adjustment for cancellations has been made in 1946 and 1947, nor for renegotiation of contracts.

•

Manufacturers Make New Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Ideal Electric & Mfg Co, Mansfield, Ohio, has appointed Salvadore R. Corrado and Mathias S. Volk, partner-owners of the Philadelphia Electrical & Machinery Co, 1772 North Front St, Philadelphia 22, Pa., as Philadelphia area distributors. They will work in conjunction with Orney E. Dunnum, Ideal Philadelphia manager.

Deepfreeze Division, Motor Products Corp, North Chicago, Ill., has promoted C. T. Redding from Philadelphia district sales manager to sales manager of the eastern region. The Deepfreeze eastern region sales office is located at 500 Fifth Ave, New York, N. Y.

Illinois Electric Porcelain Co, Macomb, Ill., has appointed D. D. Pittman as its sales representative in the states of Wisconsin, Minnesota, and Iowa and the northern peninsula of Michigan.

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Ind., Westville—State Div. Procurement & Supply, O. F. Heslar, dir., 404 State House, Indianapolis, 3 steam generating units, transformer and switch gear, 2 diesel engines, Northern Indiana Hospital $750,000. Plans deposit $25. O. M. Leonard & Assoc., 232 Franklin St., Michigan City, consult. engrs.

Kansas—Sugar Valley Electric Co-operative, Mound City, 177.21 mi. rural distr. line, conversion 6 mi. lines Linn and Miami Counties, $165,000. Frank Horton & Co., Lamar, Mo., engr.

Kentucky—U. S. Eng., 303 U. S. Courthouse, Nashville, Tenn., 1,500 kv.-a. alternating current water wheel generator, Wolf Creek Power House, Cumberland River, near Albany, Serial No. Eng. 40-058-49-44.

Md., Cumberland—P. Wks. Office, Fifth Naval Dist., U. S. Naval Base, Norfolk 11, Va., rearrangement main light and power service at Naval Reserve Training Center, Spec. 21206. Plans deposit $10.

Minn., Jackson—City, A. E. Wallace, clk., steam generating unit in municipal power plant. $100,000. Plans deposit $35. Pfeifer & Shultz, 702 Wesley Temple Bldg., Minneapolis, engrs.

N. M., Las Cruces—U. S. Eng., P. O. Box 1538, Albuquerque, rocket launching facilities, incl. electric unit heaters in existing control bldg., 730 sq. ft. 1½ in. roadmix surface pavement, 3,500 sq. yd. concrete pavement, 1,200 lin. ft. concrete cable trench, 1,800 lin. ft. waterlines, 100 lin. ft. sewerline, 800 lin. ft. underground electric lines, 1 septic tank. Plans deposit $25.

Pa., North Warren—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, a. c. electric generator, a. c. distr. sys., rewiring bldgs. at Warren State Hospital. $300,000. Plans deposit $10. A. F. Jones, ch. engr.

Texas — Lower Colorado River Auth., American Statesman Bldg., Austin, power house extens. at Buchanan Dam, near Burnet. $80,000. Plans deposit $25.

Tex., Fort Worth—Community Public Service Co., Electric Bldg., electric power plant imprvs., expans., **$500,000.**

Washington—Bonneville Power Admin., 729 N. E. Oregon St., Portland, Ore., clearing right-of-way, constructing 21 mi. access roads for Holcomb-Naselle 115 KV transmission line, Pacific Co., Inv. 4414. Plans deposit $5. L. C. Stewart, c/o owner, engr.

Washington—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Odair, steel cable trays, cable boxes, brackets, hangers and accessories for Units R4-R5-R6 and hatch covers, frames and accessories for Units R2 and R6, Grand Coulee Power Plant, Columbia Basin Proj., Spec. 2489.

Wyoming — Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Casper, structural steel, incl. beams, channels, angles, expansion bolt anchors, beam clips, field rivets and fixed and expans. bearing plates for 115 kilovolt switchyard platform, Kortes Dam, Kortes Unit, Spec. 2494.

Low Bidders & Contracts Awarded

Arkansas—U. S. Eng., 300 Broadway, Little Rock, station service generators, Bull Shoals Dam, White River, Marion and Baxter Counties, Inv. No. Eng-03-050-111, to General Electric Co., 1 River Rd., Schenectady, N. Y., **$64,076.**

Illinois—Southeastern Illinois Electric Co-operative, A. F. Lentz, mgr., Harrisburg, 400 mi. rural distr. lines, Saline, Gallatin, Hamilton, Franklin, Williamson, Johnson, Pope and Hardin Counties, substation between Benton and Thompsonville, increasing capacity Ledford and Marion substations from 1,000 to 15,000 kw. volt amperes, Galatia substation from 600 to 1,000 kw. volt amperes, own forces. **$1,000,000.**

Conn., Bloomfield — Hartford Electric Light Co., 266 Pearl St., Hartford, power substation, Prospect St. Owner builds. **$70,000.**

Ill., Chicago — City, Dpt. Purchases, Supplies & Contracts, City Hall, Dec. 2, Dearborn St. Subway, Contr. F-4, from W. E. O'Neill Constr. Co., 2751 Clybourn St., **$1,710,368.**

Ia., Keosauqua—City, City Hall, Nov. 23, light plant and distr. sys., diesel equip., from Fairbanks Morse & Co., 9 and Harney Sts., Omaha, Neb., **$67,854;** distr. sys., from Schneider Electric Works, 1106 Farnham St., Omaha, Neb., **$75,177.**

Montana—U. S. Eng., Administration Bldg., Fort Peck, Nov. 23, power plant equip., Serial No. Eng. 24-016-49-19, turbine and parts, from S. Morgan Smith Co., York, Pa., **$479,200***governor and parts, from Woodward Governor Co., Rockford, Ill., **$37,815***turbine, governor and parts, from Baldwin Locomotive Wks., Chester Pk. and Simpson St., Eddystone, Phila., Pa., **$529,306.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ark., Hot Springs—Negro Baptist Convention, 501 Malvern St., imprv., enlarging bldg. for hospital. **$750,000.**

Ark., Pine Bluff — Finkbeiner-Finkbeiner Packing Co., 30 Mulberry St., meat packing plant, **$750,000.**

Calif., Richmond—PLANT—U. S. Rubber Co., 300 2 St., San Francisco, rubber plant, **$1,000,000.**

Ga., Atlanta — Chrysler Motor Parts Corp., Murphy Ave., plans by Robert & Co. Assoc., 78 Poplar St., plant addns. **$1,000,000.**

Ky., Owensboro — Owensboro-Daviess Co. Hospital, c/o Otis Grimes, archts., Tyler Bldg., Louisville, hospital addn. $900,000. Plans deposit $50.

Mass., Medford—Tufts College, Leonard Carmichael, pres., Medford, 8 story, bsmnt., sub-bsmnt., general interior alterations to Medical School, Harvard and Harrison Aves. $1,250,000. Plans deposit $50. Arland A. Dirlam, 673 Boylston St., Boston, archt. Fay, Spofford & Thorndike, 11 Beacon St., Boston, engrs.

N. Y., New York—New York City Housing Auth., 63 Park Row, Zone 17, ten 14 story Marble Hill Houses, on site bounded by Broadway, Marble Hill Ave., Exterior, W. 225, W. 228, and W. 230 Sts., Proj. N. Y. C. 15, **$15,000,000.**

Pa., Pittsburgh—H. J. Heinz Co., 1062 Progress St. N. S., plans by Skidmore, Owings & Merrill, 5 E. 57 St., New York, N. Y., 6 story factory administration bldg., 5 story stainless steel, glass Research and Quality Control Center, 3 story warehouse, 3 story Vinegar and Sauce Bldg., incl. power plant, grain elevators. **$15,000,000.**

Tex., Big Springs—State Bd. Control, Hall Logan, chn., Austin, masonry 1,000 patient addn., Big Springs State Hospital. **$4,250,000.**

Tex., Houston—Produce Terminal, Inc., c/o Vernon C. Vaughan, 101 Travis St., produce terminal. **$2,000,000.** H. K. Ferguson Co., M & M Bldg., engrs.

Low Bidders & Contracts Awarded

Mass., West Lynn — General Electric Co., West Lynn, administration and engineering bldg., to Thompson Starrett Co., Inc., 201 Devonshire St., Boston, approx. **$2,000,000.** Bids 11/9, awarded 12/3.

Pa., Allentown—Allentown School Dist., 31 S. Penn St., 2 Junior High School Bldgs., from L. W. Hunsicker Co., 821 Chew St., **$2,359,308.** Earl Allabach, 16 S. Broad St., Phila., engr.

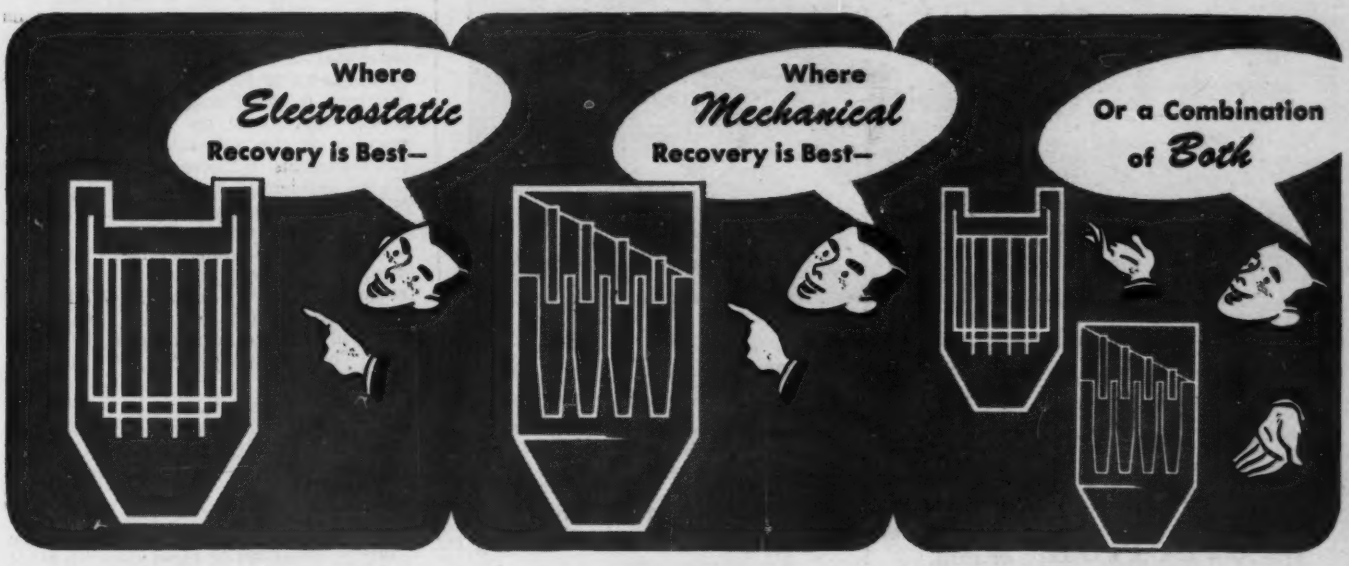
Va., Blacksburg—Virginia Polytechnic Institute, Blacksburg, Nov. 30, three 4 story 37 x 200 ft. dormitories, from Doyle-Russell, Central Natl. Bank Bldg., Richmond, **$1,145,320.**

Wis., Madison—Bd. Regents University of Wisconsin, Nov. 24, engineering bldg., from George A. Fuller Co., 111 W. Washington St., Chicago, Ill., **$1,379,000.**

This is the UNIQUE ADVANTAGE

Western Precipitation provides for simplifying YOUR Fly Ash Recovery Problems..

If you are not sure whether yours is a job for Cottrell or mechanical separation methods, you'll get an unbiased recommendation from Western Precipitation Corporation because this organization designs, engineers and installs BOTH!



THE *COTTRELL* ELECTRICAL PRECIPITATOR

Western Precipitation is the organization that pioneered the first commercial application of the now-famous Cottrell Electrical Precipitator. And its unique advancements and refinements in the basic methods, developed through more than 38 years of first-hand experience in Cottrell installations, assure you of the most modern in electrostatic recovery equipment from Western Precipitation Corporation. Cottrells handle dust, fume, fly ash, mists and other suspensions with high efficiency.

THE *MULTICLONE* MECHANICAL COLLECTOR

Companion to the Cottrell is Western Precipitation's widely used *Multiclone* equipment which offers far-reaching advantages in the mechanical separation of solids from gases. Its unique *vane* design makes possible multiple *small-diameter* separating tubes that combine high recovery efficiency with maximum compactness, minimum maintenance and wide-range adaptability to varying installation requirements. For mechanical recovery of solids, *Multiclone* is unsurpassed in operating efficiency, economy and installation simplicity.

COTTRELL AND MULTICLONE

And here's a priceless advantage provided by Western Precipitation Corporation . . . Frequently there are recovery problems where maximum efficiency and economy in first cost are obtained by using *Cottrell* and *Multiclone* equipment working together. There are many such recovery jobs—fly ash is one, perhaps yours is another—and you can get such a combination installation from one organization, under one responsibility, with one overall guarantee by bringing your recovery problem to Western Precipitation Corporation.

Send for these MULTICLONE and COTTRELL booklets!

REGARDLESS OF YOUR RECOVERY PROBLEM OR YOUR LOCATION

you can benefit by Western Precipitation's leadership and long experience in the science of recovering suspensions of all kinds—both liquid and dry—from gases, hot and cold. Western Precipitation Corporation installed the first successful Cottrell which is still in operation after 35 years of service. No matter what your industry, Western Precipitation is prepared to serve you in *all* parts of the world. Write, wire or call our nearest office.

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ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

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COTTRELL Precipitators
MULTICLONE Collectors
TURBULAIRE Spray Dryers

...in all parts of the U.S.A. and foreign countries.

Easily applied protection for lead-sheathed cable eliminates corrosion

Positive waterproofing and corrosion resistance
•
No elaborate cable cleaning necessary
•
Easy and clean to handle
•
Easily applied in narrow clearances
•
Uniform thickness insures smooth coverage
•
Easily stocked

• The application of NO-OX-ID Wrap, Dearborn's new protection for lead-sheathed cable, is as simple as unwinding a roll of tape. It slips through narrow openings with ease.

By combining two steps . . . the chemically protective coating *plus* a wrapper . . . application can be made by one man without special training or skill.

Just wind NO-OX-ID Wrap spirally around the cable, pulling it firmly to eliminate air pockets. Overlap it ½ inch. All cable area is protected against corrosion, all possibility of exposed surfaces from hand or brush application eliminated. A slight pressure of thumb and fingers on the Wrap insures a firm bond.

Supplied in 2-inch, 25-foot rolls, individually packaged.

For sample of NO-OX-ID, use the coupon below.

Dearborn
TRADE MARK REGISTERED
CHEMICAL COMPANY
Dept. EW2, 310 S. Michigan Ave., Chicago 4, Ill.
New York • Los Angeles • Toronto

Send for

this Sample

Dearborn Chemical Company, Dept. EW2
310 S. Michigan Ave., Chicago 4, Illinois

Please send sample roll of NO-OX-ID Wrap.

Name_____ Company_____
Please Print
Address_____
City_____ Zone____ State_____

RECENT RATE CHANGES

GEORGIA POWER Co has been granted a rate increase by the state Public Service Commission which will produce $3,100,000 additional revenue annually. The company had requested an increase of $4,378,000, which would be produced by the elimination of the 10% discount. The commission denied the discount elimination request but did grant three changes in the present rate schedule. These included the change from the former 40-kwhr first step at 4.17 cents per kwhr, or a minimum bill of 75 cents for 20 kwhr, to $1.11 gross, or $1 net, for the first 20 kwhr, and the next 20 kwhr at 4.17 cents, with no change in the remainder of the schedule. This increase, which amounts to 25 cents a month for the 321,667 residential customers, will produce $965,000 in annual gross revenue. All off-peak water heating is now on the standard one cent per kwhr rate. Formerly the company had a number of customers on the frozen old rate of 8 mills. Now all water heating customers are on the same rate. This will produce an additional $60,000 a year. The remaining $2,075,000 will come from a revision in the commercial and industrial rates which must be worked out by the company and submitted to the commission for approval. All new rates went into effect on meter readings after Dec 15.

PENNSYLVANIA ELECTIC Co, Johnstown, has been authorized by the state Public Utility Commission to raise rates by a net of $950,316, effective Dec 1. The new tariffs will increase charges to 10,512 industrial and commercial consumers $1,249,389 a year and decrease charges for 4,164 other large-scale users by $319,073 annually. Domestic users are not affected by the changes.

FLORIDA POWER & LIGHT Co has reduced electric rates for residential and small commercial customers, effective Dec 10. The cut in the Miami area will be about 6%. President McGregor Smith said that the cut will result from revision of the company's "inflation clause," which was adopted in mid-1946, calling for automatic increases in bills based on the price of fuel oil. The new formula ties in with fuel oil prices along with cost of other commodities.

CAROLINA POWER & LIGHT Co has asked permission of the North Carolina Utilities Commission to increase electric rates to large industrial consumers.

FORT MILL (S. C.) ELECTRIC Co has been granted authority by the state Public Service Commission to pass on to its customers the coal adjustment charge billed the company by the Duke Power Co. The Fort Mill utility buys power from Duke Power and resells to its customers.

HOME ELECTRIC Co, Altoona, Pa., has asked the State Public Utility Commission for approval to cut rates of 4,249 customers $27,188 a year and increase charges for 862 consumers by $2,188 annually. The new tariff, if approved by the commission, will take effect Jan 1. The rates of 140 customers will remain unchanged. Under the proposal a residential service rate would be set up providing a minimum charge of $1 per month. The monthly cost of the first 15 kwhr or less would be $1; 5 cents each for the next 35 kwhr; three cents for each of the 75 succeeding

kwhr, and 2½ cents for each kwhr over 120. The second schedule, covering commercial service, also provides a $1 minimum per month, but the rates for succeeding kwhr vary from the residential charge.

EAST COAST ELECTRIC CO, West Point, Va., has petitioned the State Corporation Commission for a 5% rate increase. If granted, the increase will affect the base rates for all residential, commercial, and small retail customers of the utility in the area it serves. In asking for the rate increase, the company pleaded that existing rates do not produce sufficient revenue to "support present day operations." The petition states that there will be no change in contract rates to municipalities for street lighting, pumping, or miscellaneous usage. The company purchases all of its electricity from the Virginia Electric & Power Co.

PACIFIC COUNTY PUD No. 2, Raymond, Wash., has increased its electric rates for customers using more than 800 kwhr a month. The increase will be effective with the first billings of December and will extend through March of 1949 under the present resolution.

WESTCHESTER LIGHTING CO'S $3,200,000 interim rate increase granted last August was protested by 20 representatives from seven Westchester County communities at a hearing held by the New York Public Service Commission recently.

•

Westinghouse Purchases Plant Site in Atlanta

Westinghouse Electric Corp has purchased a 17-acre site in Atlanta, Ga., with plans for the construction of a large plant for manufacture and repair of electrical equipment.

The plant will be located in the new Southland Industrial Center, which is being developed by the Nashville, Chattanooga & St. Louis Railway. The Westinghouse development will include several buildings, the first to contain more than 100,000 sq ft of floor space. Plans are now being considered for the actual structures.

•

Sprague Acquires Herlec

Sprague Electric Co, North Adams, Mass., has acquired the Herlec Corp, Milwaukee, Wis., manufacturer of ceramic capacitors and "Bulplate" printed circuits, Robert C. Sprague, president, has announced. The Milwaukee operations will continue under the direction of Herlec executives, Mr Sprague said.

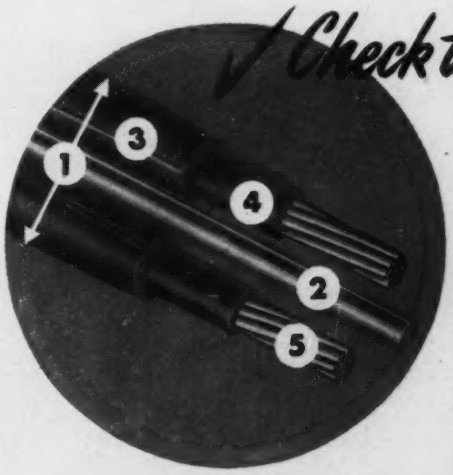
•

Gives Gift to University

Westinghouse Electric Corp has announced the gift of $200,000 to the University of Pittsburgh toward construction of a new science building and a university library.

Collyer Neutral–Supported Service Cable is "tops" with both purchasing and operating departments of utility companies. Lower in first cost than Types SE or SD, this compact cable is economical to install and maintenance is practically eliminated. Only minor changes are necessary in this simply designed cable to adapt it for use on commercial services, multiple street-lighting or secondary circuits. The weight of the cable is supported by a bare, hard drawn copper messenger which also serves as the neutral conductor, leaving the power conductors free of tension ready for easy tapping and splicing. The hard drawn copper messenger combines ample strength with excellent conductivity. This messenger may be neoprene covered, if necessary, to meet local requirements. Conductors are jacketed with neoprene, firmly bonded to Performance Grade rubber insulation of high dielectric strength. Collyer Neutral-Supported Service Cable gives extra protection against abrasion, flame, moisture, and sunlight—it is built for lifetime service.

Check these features:



1 Compact cross-section
2 Bare copper neutral (messenger)
3 Tough neoprene outer sheath
4 Performance Grade rubber insulation
5 Easy-to-get-at conductors

Write today for complete information and samples of Collyer Neutral-Supported Service Cable.

Collyer INSULATED WIRE CO.
245 ROOSEVELT AVE., PAWTUCKET, R. I.

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Ask for This Guide to Low-Cost Rural Lines!

If future plans call for the extension of rural service, be sure to ask for a copy of this Manual! A study of its contents will show where and how *Crapo* Steel Conductors can be used to profitable advantage in rural distribution systems.

This illustrated book contains pertinent data on the electrical characteristics and electrical performance of these unique conductors. It shows how construction costs can be reduced and final sag and tension data, describes construction practices, cites typical installations.

Crapo Steel Conductors are especially applicable to rural taps and branches where construction and maintenance costs are important considerations. The experience of a number of leading utilities over a period of years shows conclusively that *Crapo* Steel Conductors are giving dependable, economical and efficient service on thousands of miles of line in rural areas.

Crapo Steel Conductors are distributed by Graybar Electric Company, Inc. Ask a Graybar representative for a copy of the *Crapo* Steel Conductor Manual or write direct for Manual No. 110-C.

Indiana Steel & Wire Company
Muncie, Indiana

Crapo Steel Conductors

TECHNICAL LITERATURE

Galvanic Corrosion—A 10-page booklet covers some of the factors influencing galvanic corrosion and presents data on how galvanized effects can be minimized. The publication is available from International Nickel Co, 67 Wall St, New York 5, N. Y.

Switchgear—*Guide for Specification on Indoor Metalclad Switchgear* applies to oil or oilless breakers in indoor metalclad construction having interrupting ratings of 50,000 to 500,000 kva inclusive for 2,300 to 15,000-v service where the breakers are the removable type (either vertical left or horizontal drawout) and where the primary conductors are completely covered with insulating material. The guide is a report of the Joint Committee (AEIC, EEI and NEMA) on power circuit breakers. Designated Publication No. 115, it is obtainable from National Electrical Manufacturers Association, 155 East 44th St, New York, N. Y.; price per copy 50¢ in United States.

Storage Batteries — *Theoretical Power Output of Storage Batteries* is an investigation considering all the metals and metal oxides practically available for storage battery construction, evaluates them from the standpoints of output in whr per lb, self-discharge rate, cost, availability and shelf life. The 14-page publication is available from Gould Storage Battery Corp, Trenton, N. J.

Film Conversion—*Make Your Movies Talk* describes how to prepare film before sending it to a recording studio to have it converted from a silent to a sound version. The booklet furnishes simplified footage scale charts, lay-out for the preparation of script and other important information. Copy of publication No. 321 is obtainable from C. Lawrence Walsh and Co, 801 Brighton Road, Pittsburgh 12, Pa.

Corrosion—*Bibliographic Survey of Corrosion-1945* contains approximately 1100 references to published articles and 170 references to patents that appeared from January 1945 to February 1946 inclusive. The 129-page, 8½ x 11 in., book is published by National Association of Corrosion Engineers, 905 Southern Standard Building, Houston 2, Texas; price $5 per copy to non-members.

Materials Handling — Requirements of cranes, conveyors and industrial trucks, also route analysis, physical plant conditions, analysis of handling methods and a cost analysis are items presented in *Material Handling Manual* obtainable from General Electric Co, 1 River Road, Schenectady, N. Y.; price $1 per copy.

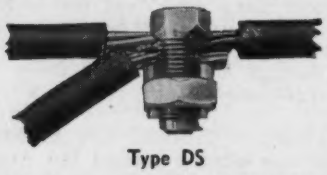
Glass Bulbs — *Nomenclature for Glass Bulbs Intended for Use with Electron Tubes and Electric Lamps* is an American Standard providing definitions, designations and shape classifications. The publication C 79.1-1948 is obtainable from American Standards Association, 70 East 45th St, New York 17, N. Y.

Stainless Steel — Composition of eight martensitic and ferritic stainless steels, AISI types, and comparison of properties are tabulated in *Tempel Topics*, Vol. 3, No. 9, published by Tempel Corp, 132 West 22nd St, New York 11, N. Y.

Directory—The fourth issue of the *Directory of the American Coordinating Committee on Corrosion* lists names, addresses, and fields of special endeavor of many of the principal corrosion workers in the United States and Canada. The 62-page directory is available from National Association of Corrosion Engineers, 905 Southern Standard Building, Houston 2, Texas; price $2 per copy.

DOSSERT *DOSSON* SERVICE CONNECTOR Type DS

Make quick and efficient connections. Made of a high strength copper alloy, insuring maximum contact pressure and area between conductors. Each Connector is designed to accommodate two of the maximum conductor sizes. The high copper content of the alloy from which these connectors are made insures freedom from corrosion and season cracking. Complete series take a size range from No. 10 Solid to 1000 MCM cable. Also available in type D S R with nut retainer. Literature upon request.



Type DS

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WIRE CONNECTORS
FAST! EFFICIENT! ECONOMICAL!

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LEAD & ALUMINUM PAINT
Simplify Maintenance
Give Maximum Protection
Subox, Inc.
HACKENSACK, N. J.